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PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

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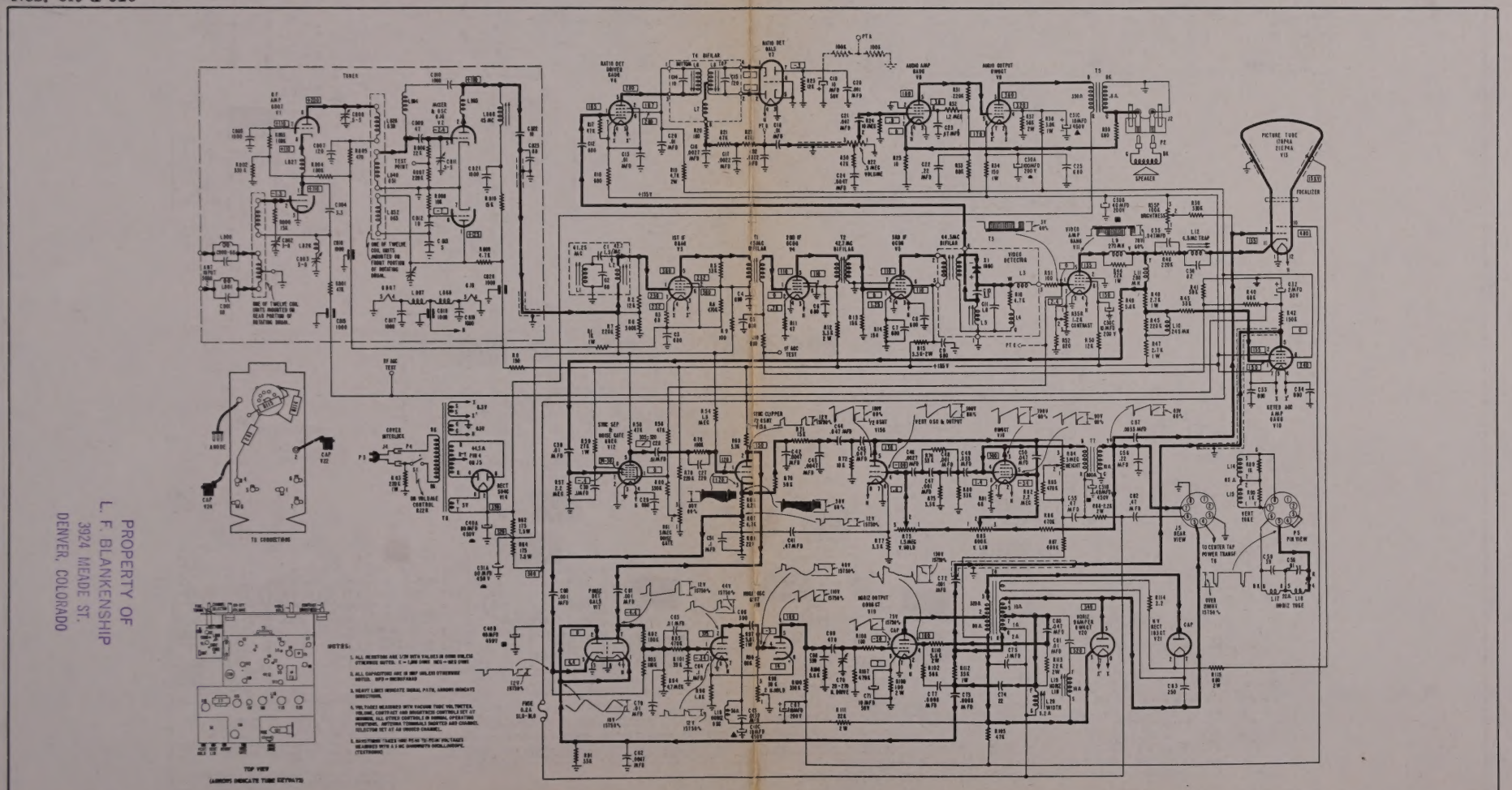
Bendix – Mod. KM17Cd-KS21C, STM17C, TM17Cd, TS17C, TS21C. Servicer front.
(Ch. T17, T17-1)

Sylvania – Mod. 392, 396 (Ch. 1-515-1,-2) Servicer front.

The PHOTOFACT Servicer

Vol. 32
Nos. 319 & 320 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ June 1, 1956

The service information in this Servicer provides data on models which we have been unable to present in PHOTOFACT Folders. The receivers are not in current production; a requirement for PHOTOFACT coverage, and we are therefore presenting schematics and supplementary data that will be of assistance when servicing these models.



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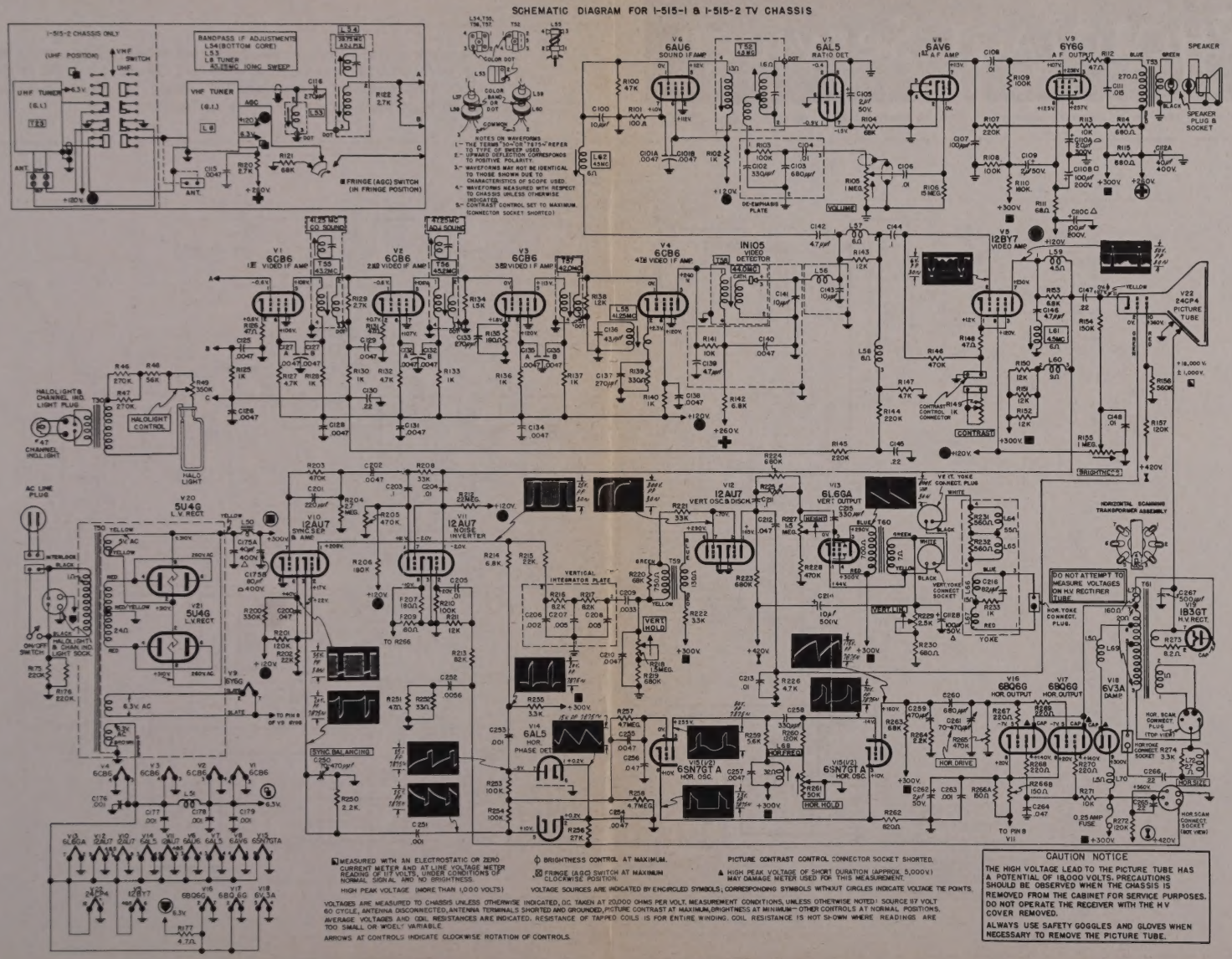
Bendix Models KM17CD, KS21C, SKM17C, STM17C, TM17CD, TS17C, TS21C (Ch. T17, T17-1)

Schematic Diagram Courtesy of Bendix Radio, Div. of Bendix Aviation Corp.


SCHEMATIC DIAGRAM FOR 1-515-1 & 1-515-2 TV CHASSIS
1-515-2 CHASSIS ONLY
VHF SWITCH
UHF TUNER
VHF TUNER
BANDPASS I.F. ADJUSTMENTS
L54 (BOTTOM CORE)
L53
L& TUNER
45.25MC IOMC SWEEP
L54
39.75MC
45.25MC
L55
COLOR DOT
L53
COLOR BAND OR DOT
L57
L59
L60
COMMON
NOTES ON WAVEFORMS
1.- THE TERMS "30-0R-75?5-V" REFER TO TYPE OF SWEEP USED. UPWARD DEFLECTION CORRESPONDS TO POSITIVE POLARITY.
2.- WAVEFORMS MAY NOT BE IDENTICAL TO THOSE SHOWN DUE TO CHARACTERISTICS OF SCOPE USED.
4.- WAVEFORMS MEASURED WITH RESPECT TO CHASSIS UNLESS OTHERWISE INDICATED.
5.- CONTRAST CONTROL SET TO MAXIMUM. (CONNECTOR SOCKET SHORTED)
FRINGE (AGC) SWITCH (IN FRINGE POSITION)
V6 6AU6 SOUND I.F. AMP
V7 6AL5 RATIO DET.
V8 6AV6 1st A.F. AMP
V9 6Y6G A.F. OUTPUT
SPEAKER
SPEAKER PLUG & SOCKET
DE-EMPHASIS PLATE
VOL. LINE
V1 6CB6 1st VIDEO I.F. AMP
V2 6CB6 2nd VIDEO I.F. AMP
V3 6CB6 3rd VIDEO I.F. AMP
V4 6CB6 4th VIDEO I.F. AMP
41.25 MC CO. SOUND
41.25MC ADJ. SOUND
T55 43.7MC
T56 45.2MC
T57 45.2MC
T58 43.7MC
L58 41.25MC
L56 41.25MC
1N105 VIDEO DETECTOR
V5 12BY7 VIDEO AMP
L59 4.5MC
L61 4.5MC
L60
V22 24CP4 PICTURE TUBE
+18,000 V. ± 1,000V.
CONTRAST CONTROL 1K CONNECTOR
CONTRAST
BRIGHTNESS
HORIZONTAL SCANNING TRANSFORMER ASSEMBLY
HALOLIGHT & CHANNEL IND. LIGHT PLUG
HALOLIGHT CONTROL
CHANNEL INDICATOR LIGHT
HALO LIGHT
AC LINE PLUG
INTERLOCK
ON/OFF SWITCH
HALOLIGHT & CHAN. IND. LIGHT SOCK.
V20 5U4G L.V. RECT.
V21 5U4G L.V. RECT.
V9 6Y6G
TO PIN 8 OF V9 6Y6G
V10 12AU7 SYNC SEP. & AMP
V11 12AU7 NOISE INVERTER
V12 12AU7 VERT. OSC. & OSCH.
V13 6L6GA VERT. OUTPUT
VERT. YOKE CONNECT PLUG
VERT. YOKE CONNECT SOCKET
YOKE
HOR. YOKE CONNECT PLUG
DO NOT ATTEMPT TO MEASURE VOLTAGES ON H.V. RECTIFIER TUBE
T61
V19 1B3GT H.V. RECT.
VERTICAL INTEGRATOR PLATE
VERT. HOLD
SYNC BAL ANCING
TO R266
V14 6AL5 HOR. PHASE DET.
V15(V2) 6SN7GTA HOR. OSC.
HOR. FREQ.
HOR. HOLD
V16 6BQ6G HOR. OUTPUT
V17 6BQ6G HOR. OUTPUT
V18 6V3A DAMP.
HOR. DRIVE
0.25 AMP FUSE
TO PIN 8 V11
HOR. SCAN CONNECT PLUG (TOP VIEW)
HOR. YOKE CONNECT SOCKET
HOR. SCAN CONNECT SOCKET (BOT. VIEW)
HORIZ.
V4 6CB6
V3 6CB6
V2 6CB6
V1 6CB6
V9 6Y6G
V12 12AU7
V10 12AU7
V14 6AL5
V15 6SN7GTA
V16 6BQ6G
V17 6BQ6G
V18 6V3A
V5 12BY7
V20 5U4G
V21 5U4G
MEASURED WITH AN ELECTROSTATIC OR ZERO CURRENT METER AND AT LINE VOLTAGE METER READING OF 117 VOLTS UNDER CONDITIONS OF NORMAL SIGNAL AND NO BRIGHTNESS.
HIGH PEAK VOLTAGE (MORE THAN 1,000 VOLTS)
BRIGHTNESS CONTROL AT MAXIMUM.
FRINGE (AGC) SWITCH AT MAXIMUM CLOCKWISE POSITION.
VOLTAGE SOURCES ARE INDICATED BY ENCIRCLED SYMBOLS; CORRESPONDING SYMBOLS WITHOUT CIRCLES INDICATE VOLTAGE TIE POINTS.
PICTURE CONTRAST CONTROL CONNECTOR SOCKET SHORTED.
HIGH PEAK VOLTAGE OF SHORT DURATION (APPROX. 5,000V) MAY DAMAGE METER USED FOR THIS MEASUREMENT.
VOLTAGES ARE MEASURED TO CHASSIS UNLESS OTHERWISE INDICATED, DC. TAKEN AT 20,000 OHMS PER VOLT. MEASUREMENT CONDITIONS, UNLESS OTHERWISE NOTED: SOURCE 117 VOLT 60 CYCLE, ANTENNA DISCONNECTED, ANTENNA TERMINALS SHORTED AND GROUNDED, PICTURE CONTRAST AT MAXIMUM, BRIGHTNESS AT MINIMUM—OTHER CONTROLS AT NORMAL POSITIONS. AVERAGE VOLTAGES AND COIL RESISTANCES ARE INDICATED. RESISTANCE OF TAPPED COILS IS FOR ENTIRE WINDING. COIL RESISTANCE IS NOT SHOWN WHERE READINGS ARE TOO SMALL OR WOEL? VARIABLE.
ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION OF CONTROLS.
CAUTION NOTICE
THE HIGH VOLTAGE LEAD TO THE PICTURE TUBE HAS A POTENTIAL OF 18,000 VOLTS. PRECAUTIONS SHOULD BE OBSERVED WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE PURPOSES. DO NOT OPERATE THE RECEIVER WITH THE H.V. COVER REMOVED.
ALWAYS USE SAFETY GOGGLES AND GLOVES WHEN NECESSARY TO REMOVE THE PICTURE TUBE.

Sylvania Models 392, 396 Series (Ch. 1-515-1, -2)

Schematic Diagram Courtesy of Sylvania Electric Products, Inc.

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 12 IN SET 290

Westinghouse chassis V-2316-11, V-2316-12, V-2317-61, V-2317-62, V-2326-101 and V-2327-601 were covered in Photofact Folder 12 — Set 290.

Several new models and chassis, along with late production changes, are added with the publication of this bulletin.

Following is a complete list of models, chassis and tuners used in each receiver.

MODEL	CHASSIS	TUNER
H-892T17 (V)	V-2316-11	V-15560-1
H-892T17 (S)	V-2316-12	V-15510-1
H-892TU17	V-2326-101	V-15310-1
H-894T17 (V)	V-2316-11	V-15560-1
H-894T17 (S)	V-2316-12	V-15510-1
H-894TU17	V-2326-101	V-15310-1
H-896T21 (V)	V-2317-61	V-15560-1
H-896T21 (S)	V-2317-62	V-15510-1
H-896TU21	V-2327-601	V-15310-1
H-898T21 (V)	V-2317-61	V-15560-1
H-898T21 (S)	V-2317-62	V-15510-1
H-898TU21	V-2327-601	V-15310-1
H-899T21 (V)	V-2317-61	V-15560-1
H-899T21 (S)	V-2317-62	V-15510-1
H-899TU21	V-2327-601	V-15310-1
H-900C21 (V)	V-2317-61	V-15560-1
H-900C21 (S)	V-2317-62	V-15510-1
H-900CU21	V-2327-601	V-15310-1
H-901C21 (V)	V-2317-61	V-15560-1
H-901C21 (S)	V-2317-62	V-15510-1
H-901CU21	V-2327-601	V-15310-1
H-902K21 (V)	V-2317-61	V-15560-1
H-902K21 (S)	V-2317-62	V-15510-1
H-902KU21	V-2327-601	V-15310-1
H-903K21 (V)	V-2317-61	V-15560-1
H-903K21 (S)	V-2317-62	V-15510-1
H-903KU21	V-2327-601	V-15310-1
H-904K21 (V)	V-2317-61	V-15560-1
H-904K21 (S)	V-2317-62	V-15510-1
H-904KU21	V-2327-601	V-15310-1
H-905K21 (V)	V-2317-61	V-15560-1
H-905K21 (S)	V-2317-62	V-15510-1

WESTINGHOUSE CHASSIS V-2189-5, V-2316-11, V-2316-12, V-2316-45, V-2317-05, V-2317-61, V-2317-62, V-2317-81, V-2317-82, V-2317-95, V-2326-101, V-2326-404, V-2327-004, V-2327-601, V-2327-904

PRODUCTION CHANGES
BULLETIN 158

PRODUCTION CHANGES
BULLETIN 158

PROPERTY OF
L. F. BLANKENSHIP
3824 MEADE ST.
DENVER, COLORADO

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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MODEL	CHASSIS	TUNER
H-905KU21	V-2327-601	V-15310-1
H-908T17 (V)	V-2316-11	V-15560-1
H-908T17 (S)	V-2316-12	V-15510-1
H-908TU17	V-2326-101	V-15310-1
H-909T17 (V)	V-2316-11	V-15560-1
H-909T17 (S)	V-2316-12	V-15510-1
H-909TU17	V-2326-101	V-15310-1
H-910T17 (V)	V-2316-11	V-15560-1
H-910T17 (S)	V-2316-12	V-15510-1
H-910TU17	V-2326-101	V-15310-1
H-912T21 (V)	V-2317-61	V-15560-1
H-912T21 (S)	V-2317-62	V-15510-1
H-912TU21	V-2327-601	V-15310-1
H-913T21 (V)	V-2317-61	V-15560-1
H-913T21 (S)	V-2317-62	V-15510-1
H-913TU21	V-2327-601	V-15310-1
H-914T21 (V)	V-2317-61	V-15560-1
H-914T21 (S)	V-2317-62	V-15510-1
H-914TU21	V-2327-601	V-15310-1
H-916T17	V-2316-45	V-16050-1
H-916TU21	V-2326-404	V-15900-1
H-919T17	V-2316-45	V-16050-1
H-919TU17	V-2326-404	V-15900-1
H-920T17	V-2316-45	V-16050-1
H-920TU17	V-2326-404	V-15900-1
H-921T17	V-2316-45	V-16050-1
H-921TU17	V-2326-404	V-15900-1
H-924T21	V-2317-05 or V-2317-95	V-16050-1
H-924TU21	V-2327-004 or V-2327-904	V-15900-1
H-927T21	V-2317-05 or V-2317-95	V-16050-1
H-927TU21	V-2327-004 or V-2327-904	V-15900-1
H-927T21	V-2317-05 or V-2317-95	V-16050-1
H-927TU21	V-2327-004 or V-2327-904	V-15900-1
H-928T21	V-2317-05 or V-2317-95	V-16050-1
H-928TU21	V-2327-004 or V-2327-904	V-15900-1
H-929T21	V-2317-05 or V-2317-95	V-16050-1
H-929TU21	V-2327-004 or V-2327-904	V-15900-1
H-965K21	V-2317-05 or V-2317-95	V-16050-1
H-965KU21	V-2327-004 or V-2327-904	V-15900-1
H-966K21	V-2317-05 or V-2317-95	V-16050-1
H-966KU21	V-2327-004 or V-2327-904	V-15900-1
	V-2317-81/V-2189-5	V-15560-1
	V-2317-82/V-2189-5	V-15510-1
	V-2327-801/V-2189-5	V-15310-1

TO IMPROVE BANDPASS OF TUNER V-15510-1

The 22KΩ resistor connecting to pin 9 of the mixer tube (5AT8) in tuner V-15510-1 has been decreased to 10KΩ.

A 3.3MMF capacitor has been added from the high side of the 4.7KΩ resistor (RF AGC Line) to ground.

HORIZONTAL OSCILLATOR COIL CHANGED

L26, horizontal oscillator coil has been changed to part #V-15914-1. This change is a decrease in the physical length of the coil form.

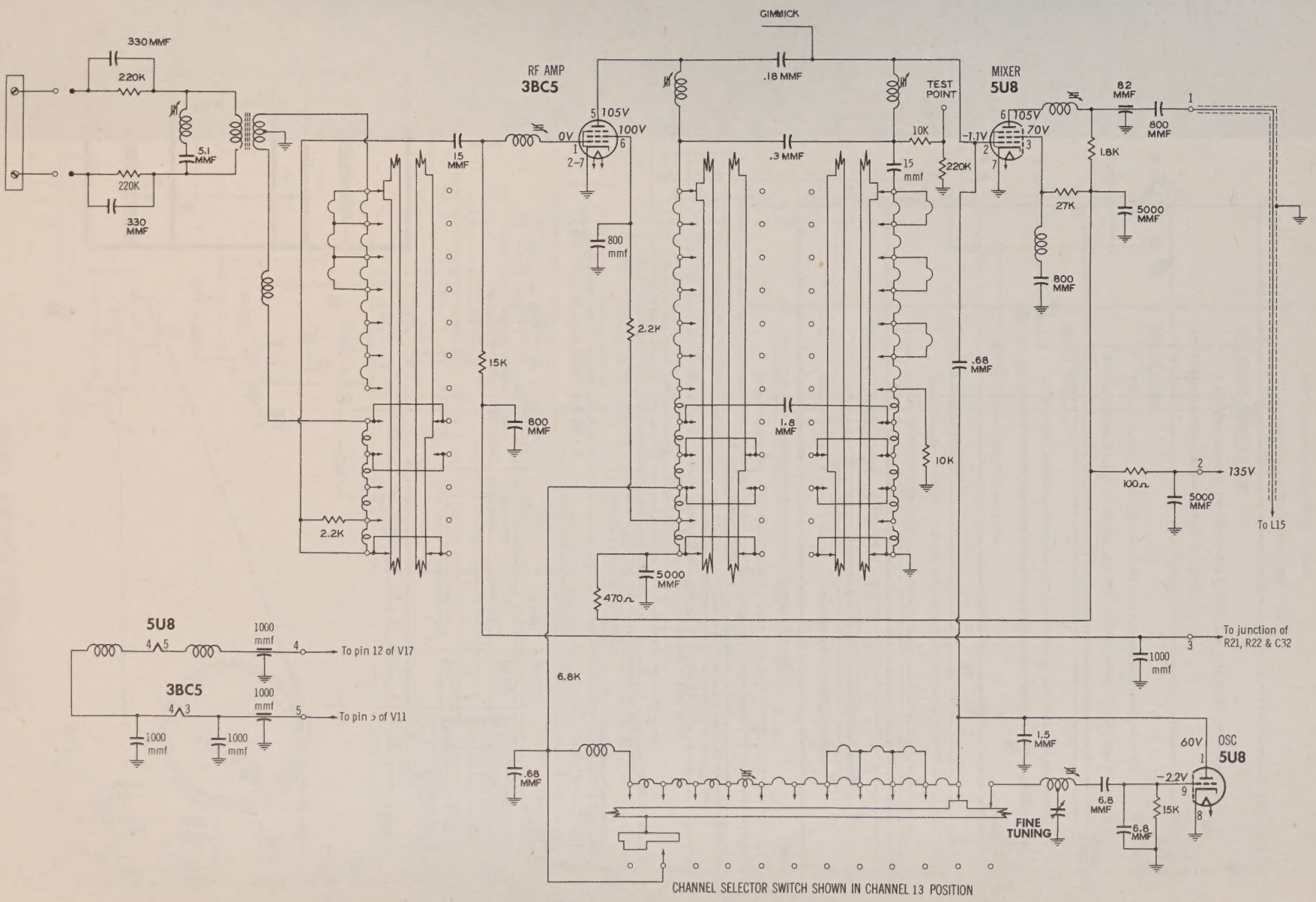

330 MMF
220K
5.1 MMF
220K
330 MMF
RF AMP
3BC5
GIMMICK
.18 MMF
TEST POINT
MIXER
5U8
82 MMF
800 MMF
1.8K
27K
5000 MMF
800 MMF
105V
100V
0V
105V
170V
-1.1V
10K
220K
15 mmf
.3 MMF
15 MMF
800 mmf
2.2K
15K
800 MMF
.68 MMF
1.8 MMF
10K
2.2K
5000 MMF
470Ω
100Ω
135V
5000 MMF
To L15
5U8
1000 mmf
To pin 12 of V17
3BC5
1000 mmf
To pin 5 of V11
1000 mmf
1000 mmf
6.8K
To junction of R21, R22 & C32
1000 mmf
1.5 MMF
60V
OSC
5U8
-2.2V
.68 MMF
6.8 MMF
15K
6.8 MMF
FINE TUNING
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION

FIG. 1

	TO INCREASE PICTURE CONTRAST R50 is decreased from 22KΩ to 15KΩ. The tolerance of R49 has been reduced to 5%.
	NEW SELENIUM RECTIFIERS A new type selenium rectifer (part #V-15920-1) is used in late production. This new type has the positive terminal twisted 90 degrees.
	NEW IF TUBES The lst. and 2nd. video IF tubes have been changed from 3CB6 to 3BZ6. Chassis using 3BZ6 for the lst. and 2nd. video IF tubes, the AGC control (R9) is omitted.
	NEW TUNERS In the model breakdown sheet you will notice several new tuners are introduced. A schematic of tuner V-16050-1 is given in Fig. 1. A schematic of tuner V-15900-1 is given in Fig. 2. Alignment is given later in this bulletin.
	COMBINATION RECEIVERS Radio chassis V-2189-5 is used in all combination receivers. A schematic of this radio chassis is given in Fig. 3. Alignment procedure and proper dial cord stringing is also given.
	OSCILLATOR RADIATION Early production of tuner V-15900-1 will have two disc capacitors(.001MFD) connected from the rear tuner terminals 7 and 8 to ground, to suppress local oscillator radiation.
	TO ELIMINATE TWEET INTERFERENCE ON HIGH CHANNELS In late production .005MFD capacitor is added from pin 4 of V9 to the B- terminal of L25.

OSCILLATOR ALIGNMENT FOR TUNER V-16050-1

Replacement of the 5U8 mixer oscillator tube may change the oscillator frequency enough to necessitate realignment of the oscillator. The slugs can be adjusted from the top of the cabinet with a non-metallic alignment tool.

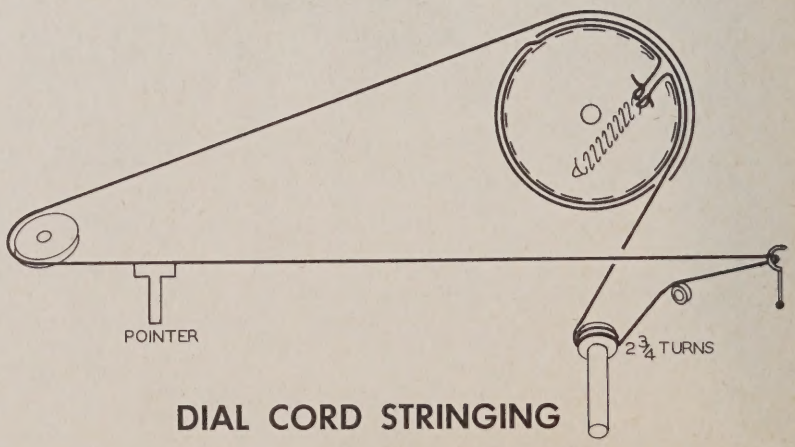
1. Set the fine tuning to its mid-range position. Keep it in this position during alignment.
2. Set the channel selector to the highest high-band (7-13) channels operating in your area.
3. Adjust the high-band adjustment slug (A1) for best picture detail and sound.
4. Set the channel selector to the highest low-band (2-6) channel operating in your area.
5. Adjust the low-band slug (A2) for best sound and picture detail.
6. Check the previously made high-band adjustment. If tuning has changed repeat the procedure.

RF AND MIXER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion is not recommended in the field.

ALIGNMENT FOR RADIO CHASSIS V-2189-5

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to antenna stator lug on gang. Low side to chassis.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1625KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal	"	A6	"



DIAL CORD STRINGING

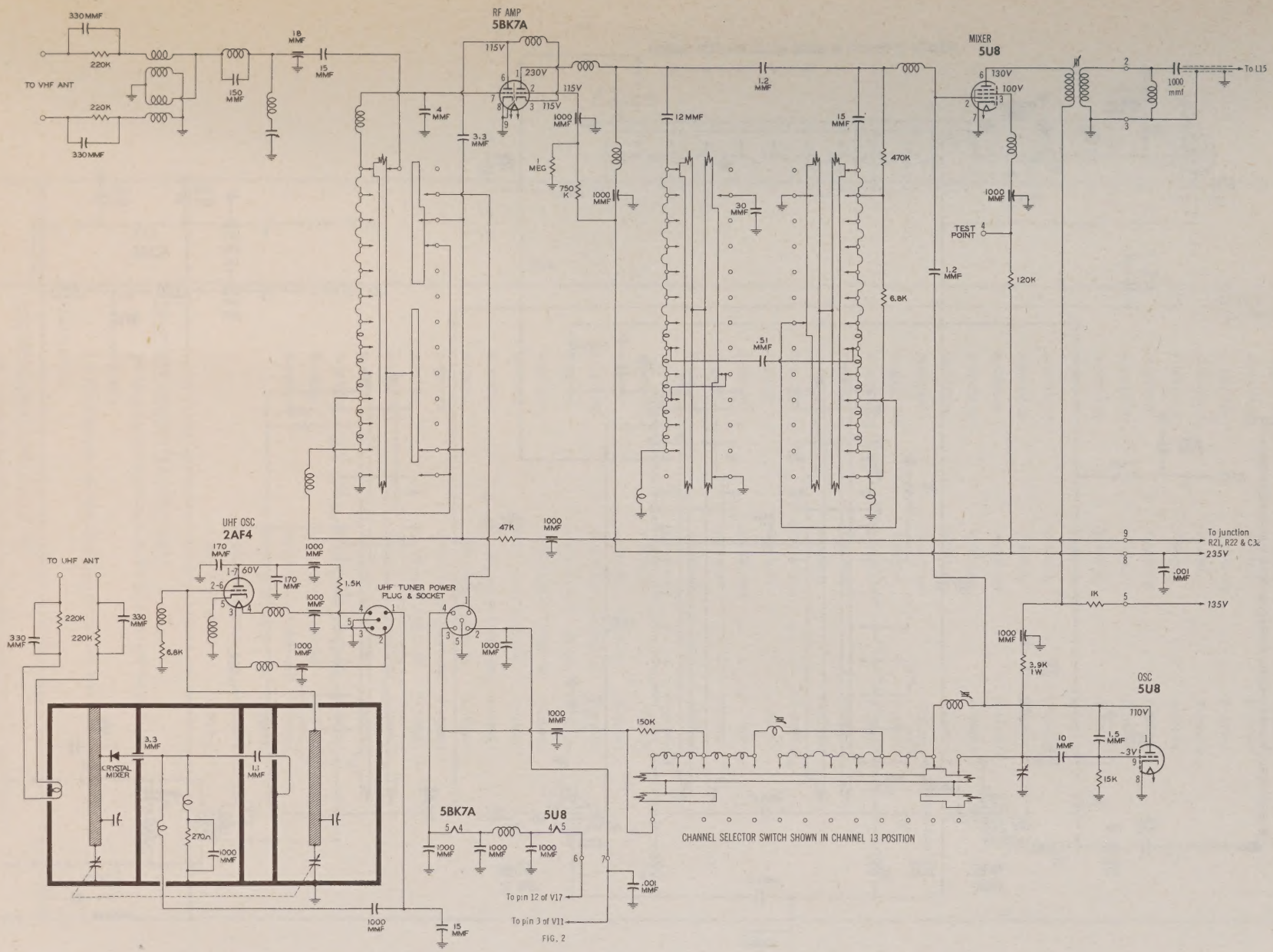

330MMF
220K
TO VHF ANT
220K
330MMF
18 MMF
15 MMF
150 MMF
RF AMP
5BK7A
115V
230V
115V
115V
.4 MMF
3.3 MMF
1000 MMF
1 MEG
750 K
1000 MMF
12 MMF
1.2 MMF
15 MMF
470K
30 MMF
6.8K
.51 MMF
MIXER
5U8
130V
100V
To L15
1000 mmf
1000 MMF
TEST POINT
1.2 MMF
120K
UHF OSC
2AF4
170 MMF
1000 MMF
60V
1.5K
170 MMF
1000 MMF
1000 MMF
TO UHF ANT
220K
220K
330 MMF
330 MMF
6.8K
UHF TUNER POWER PLUG & SOCKET
47K
1000 MMF
To junction R21, R22 & C3
235V
.001 MMF
1K
135V
1000 MMF
3.9K 1W
OSC
5U8
110V
150K
10 MMF
1.5 MMF
-3V
15K
3.3 MMF
CRYSTAL MIXER
1.1 MMF
270Ω
1000 MMF
5BK7A
5U8
1000 MMF
1000 MMF
1000 MMF
.001 MMF
To pin 12 of V17
To pin 3 of V11
1000 MMF
15 MMF
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION

FIG. 2

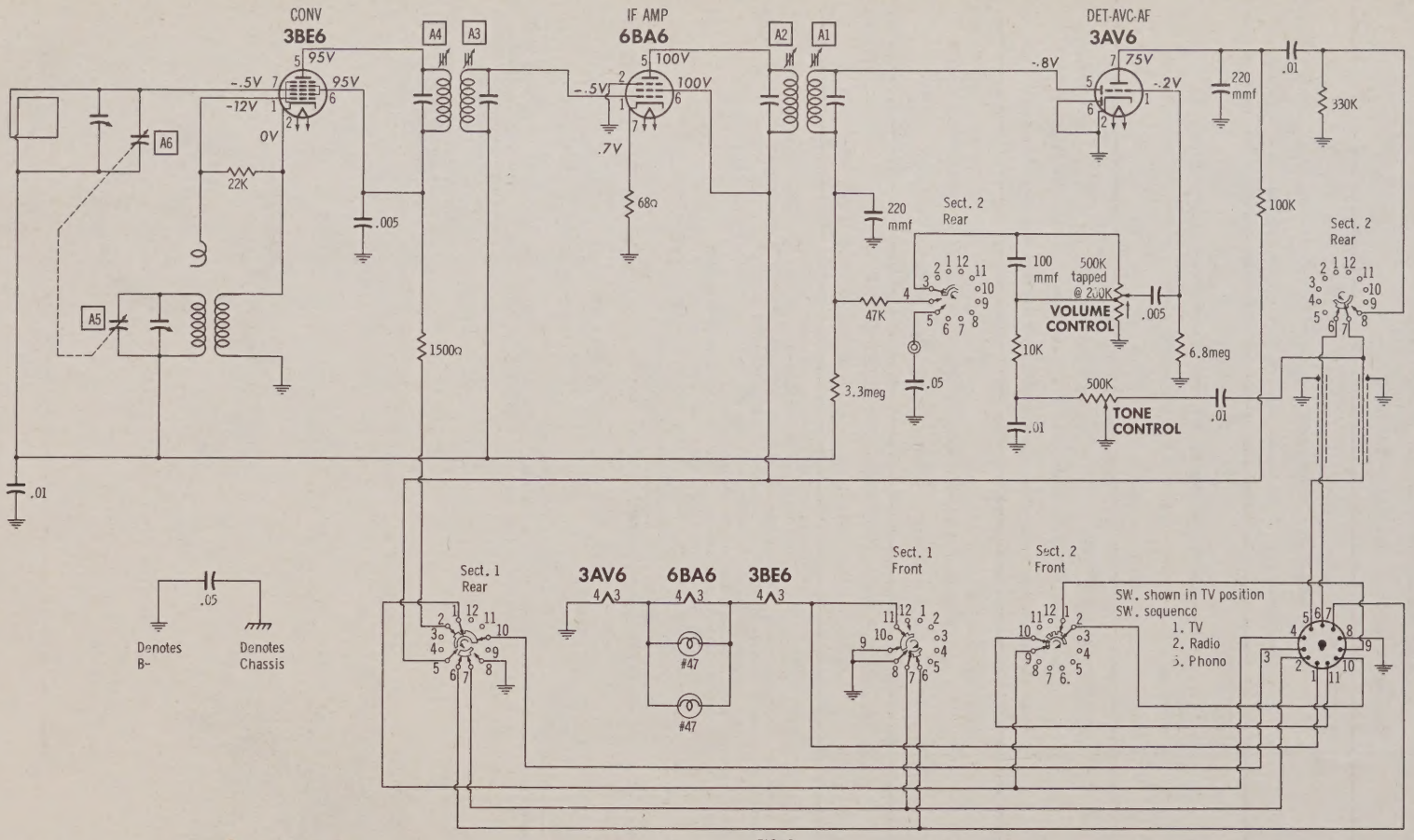

CONV
3BE6
IF AMP
6BA6
DET-AVC-AF
3AV6
A1
A2
A3
A4
A5
A6
95V
-.5V
-12V
0V
100V
.7V
75V
-.8V
-.2V
22K
.005
68Ω
1500Ω
220 mmf
.01
330K
100K
Sect. 2 Rear
100 mmf
500K tapped @ 200K
VOLUME CONTROL
47K
10K
6.8meg
3.3meg
.05
500K
TONE CONTROL
Sect. 1 Rear
Sect. 1 Front
Sect. 2 Front
#47
SW. shown in TV position
SW. sequence
1. TV
2. Radio
3. Phono
Denotes B-
Denotes Chassis

FIG. 3

PHOTOFACT* Folder

*TRADE MARK

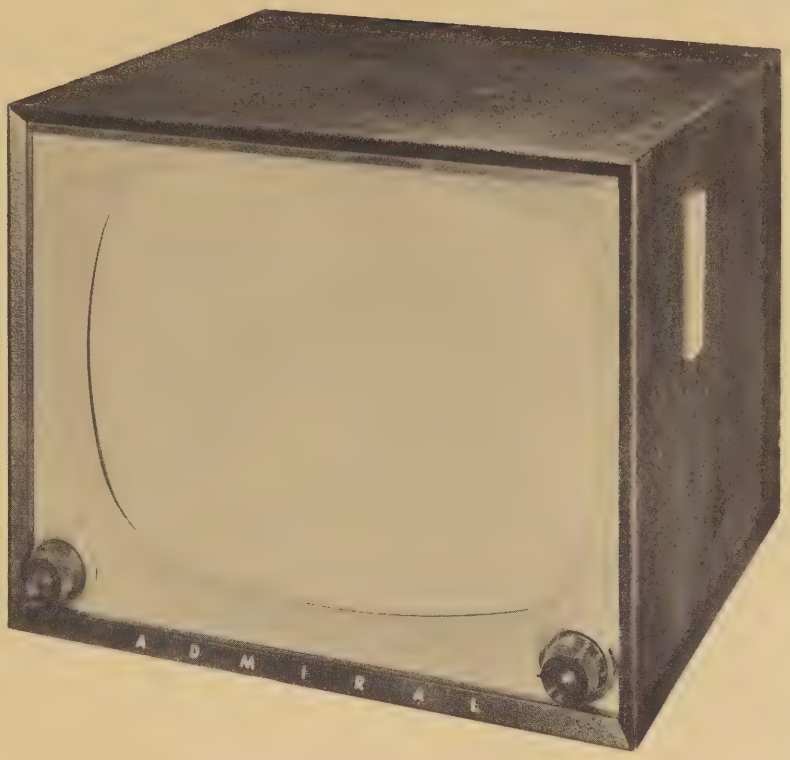
RETMA MEMBER

ADMIRAL CHASSIS 18Y4B, BS, BSA, E, EA, EF, ES, ESA, L, LS

IMPORTANT FILING NOTICE

The contents for this envelope will be found among the last folders in this complete set of folders . . . *unless* it has been purchased as part of a *complete* volume of PHOTOFACTS assembled in a DeLuxe Binder.

Merely insert the corresponding folder on this model in this envelope to retain proper filing and indexing order.



ADMIRAL MODEL T2301D (Ch. 18Y4B)

TRADE NAME	ADMIRAL	MODELS	CHASSIS
		T2301D, T2306D, T2307D	18Y4B or 18Y4BS
		C23A1, C23A2, C23A3, C23A8	18Y4E or 18Y4ES
		C23A6, C23A7	18Y4E or 18Y4EF
		C23A1A, C23A2A, C23A3A, C23A8A	18Y4EA or 18Y4ESA
		T2301DR, T2302DR, T2303DR	18Y4L or 18Y4LS

MANUFACTURER	Admiral Corp., 3800 W. Cortland Ave., Chicago 47, Illinois
TYPE SET	Television Receiver
TUBES	Eighteen
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING 1.4 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 25.75MC, Sound IF 21.25MC (Intercarrier)

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ADMIRAL CHASSIS 18Y4B, BS, BSA, E, EA, EF, ES, ESA, L, LS

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

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DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type control knobs from front panel of cabinet.

2. Remove 12 metal screws. Remove rear cover.

3. Remove picture tube socket, speaker plug, HV lead, ion trap and 2 control assembly plugs.

4. Remove 2 metal screws holding AC interlock bracket and 2 metal screws holding antenna terminal bracket.

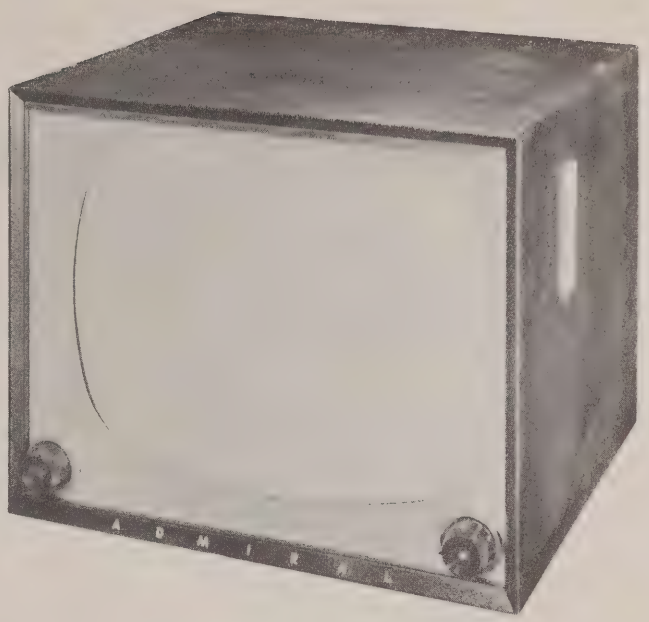
5. Remove 8 metal screws from 2 corner brackets.

6. Remove 4 chassis bolts. Remove chassis.

7. Remove 2 metal screws holding control panel to cabinet, also unclip on-off-volume and contrast control assembly from inside front of cabinet.

8. Remove 2 speaker screws. Remove speaker.

NOTE: If it is necessary to remove the chassis for servicing, it is also necessary to remove the speaker. The audio output transformer and filter choke is mounted on the speaker and must be connected for proper operation.



MODELS	CHASSIS
T2301D, T2306D, T2307D	18Y4B or 18Y4BS
C23A1, C23A2, C23A3, C23A8	18Y4E or 18Y4ES
C23A6, C23A7	18Y4E or 18Y4EF
C23A1A, C23A2A, C23A3A, C23A8A	18Y4EA or 18Y4ESA
T2301DR, T2302DR, T2303DR	18Y4L or 18Y4LS

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SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, thru the small hole in the cabinet above the channel selector shaft.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 push-on type control knobs. Remove 4 metal screws holding metal strip at the top edge of the safety glass. Remove metal strip and safety glass. Use extreme caution when removing safety glass.

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be done by adjusting the flexible shaft at the back of the set. Adjust the horizontal hold until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L21) located on the bottom of the chassis. Adjustment can be made from the top of the chassis by inserting alignment tool thru hollow hex slug (primary adjustment) to bottom adjustment of L21.

FUSES

One fuse is used for LV power supply protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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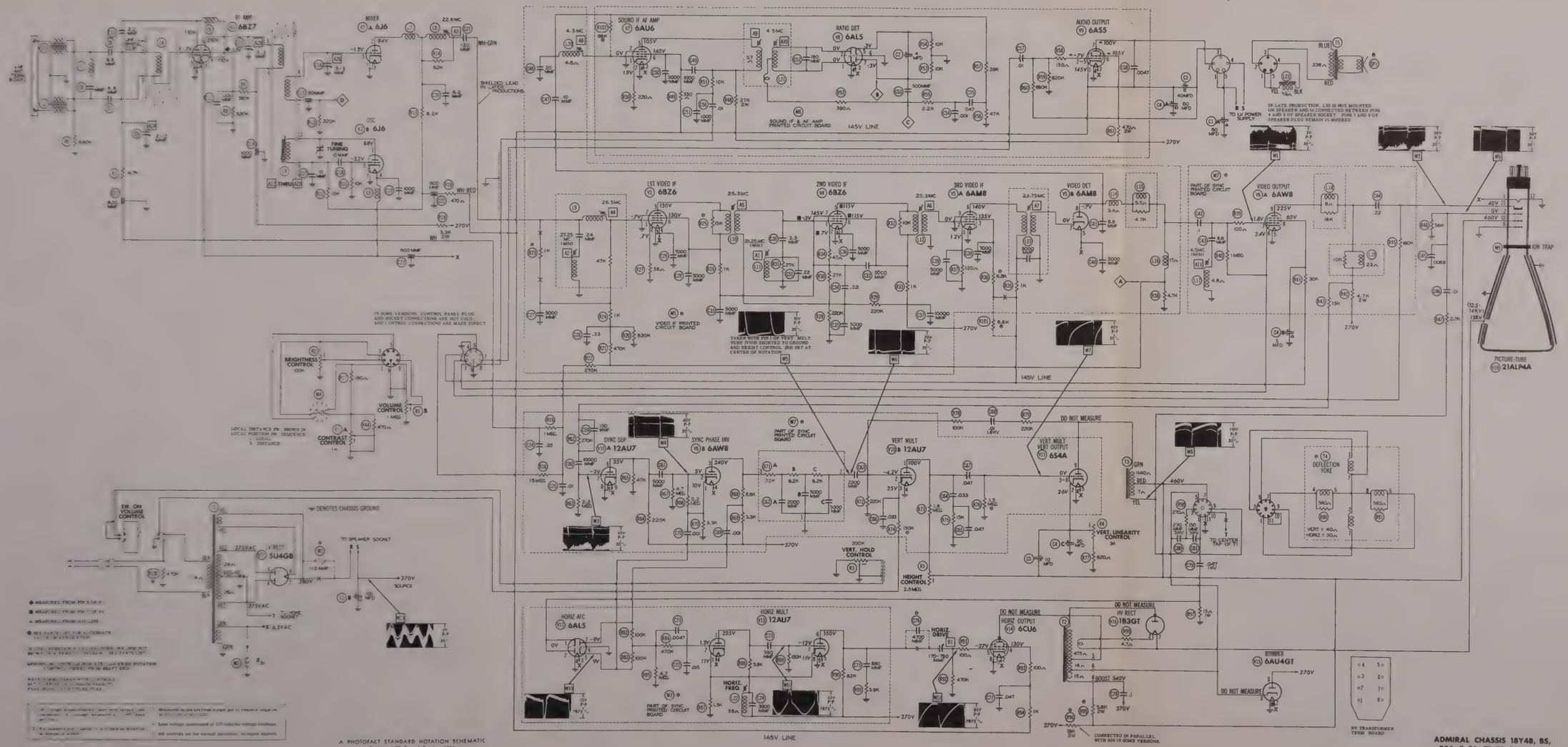
ADMIRAL CHASSIS 18Y4B, BS, BSA, E, EA, EF, ES, ESA, L, LS
1ST AMP 6BZ7
MIXER V1A 6J6
OSC V1B 6J6
SOUND IF AF AMP V7 6AU6
RATIO DET V8 6AL5
AUDIO OUTPUT V9 6AS5
1ST VIDEO IF V3 6BZ6
2ND VIDEO IF V4 6BZ6
3RD VIDEO IF V5A 6AM8
VIDEO DET V5B 6AM8
VIDEO OUTPUT V6A 6AW8
SYNC SEP V11A 12AU7
SYNC PHASE INV V6B 6AW8
VERT MULT V10B 12AU7
VERT MULT OUTPUT V11 6S4A
HORIZ AFC V12 6AL5
HORIZ MULT V13 12AU7
HORIZ OUTPUT V14 6CU6
HV RECT V10 1B3GT
6AU4GT
PICTURE TUBE V17 21ALP4A
ION TRAP
DEFLECTION YOKE
VERT LINEARITY CONTROL 3K
VERT HOLD CONTROL 200K
HEIGHT CONTROL 2.5MEG
BRIGHTNESS CONTROL
VOLUME CONTROL 1 MEG
CONTRAST CONTROL 1K
SW ON VOLUME CONTROL
5U4GB
TO SPEAKER SOCKET
TO LV POWER SUPPLY
TO CENTER TAP OF T4
HV TRANSFORMER TERM BOARD
DENOTES CHASSIS GROUND
145V LINE
270V
DO NOT MEASURE
IN LATE PRODUCTION, L23 IS NOT MOUNTED ON SPEAKER AND IS CONNECTED BETWEEN PINS 4 AND 5 OF SPEAKER SOCKET. PINS 1 AND 5 OF SPEAKER PLUG REMAIN JUMPERED
IN SOME VERSIONS, CONTROL PANEL PLUG AND SOCKET CONNECTIONS ARE NOT USED AND CONTROL CONNECTIONS ARE MADE DIRECT
LOCAL DISTANCE (2nd SHOWN IN LOCAL PORTION IN SEQUENCE OF LOCAL TO DISTANCE
SHIELDED LEAD IN LATER PRODUCTIONS
TAKEN WITH POTENTIOMETER VERT. MULTIVIBRATOR (V10B) SHORTED TO GROUND AND HEIGHT CONTROL (R5) SET AT CENTER OF ROTATION
CONNECTED IN PARALLEL WITH R96 IN SOME VERSIONS.
VIDEO IF PRINTED CIRCUIT BOARD
SOUND IF & AF AMP PRINTED CIRCUIT BOARD
PART OF SYNC PRINTED CIRCUIT BOARD
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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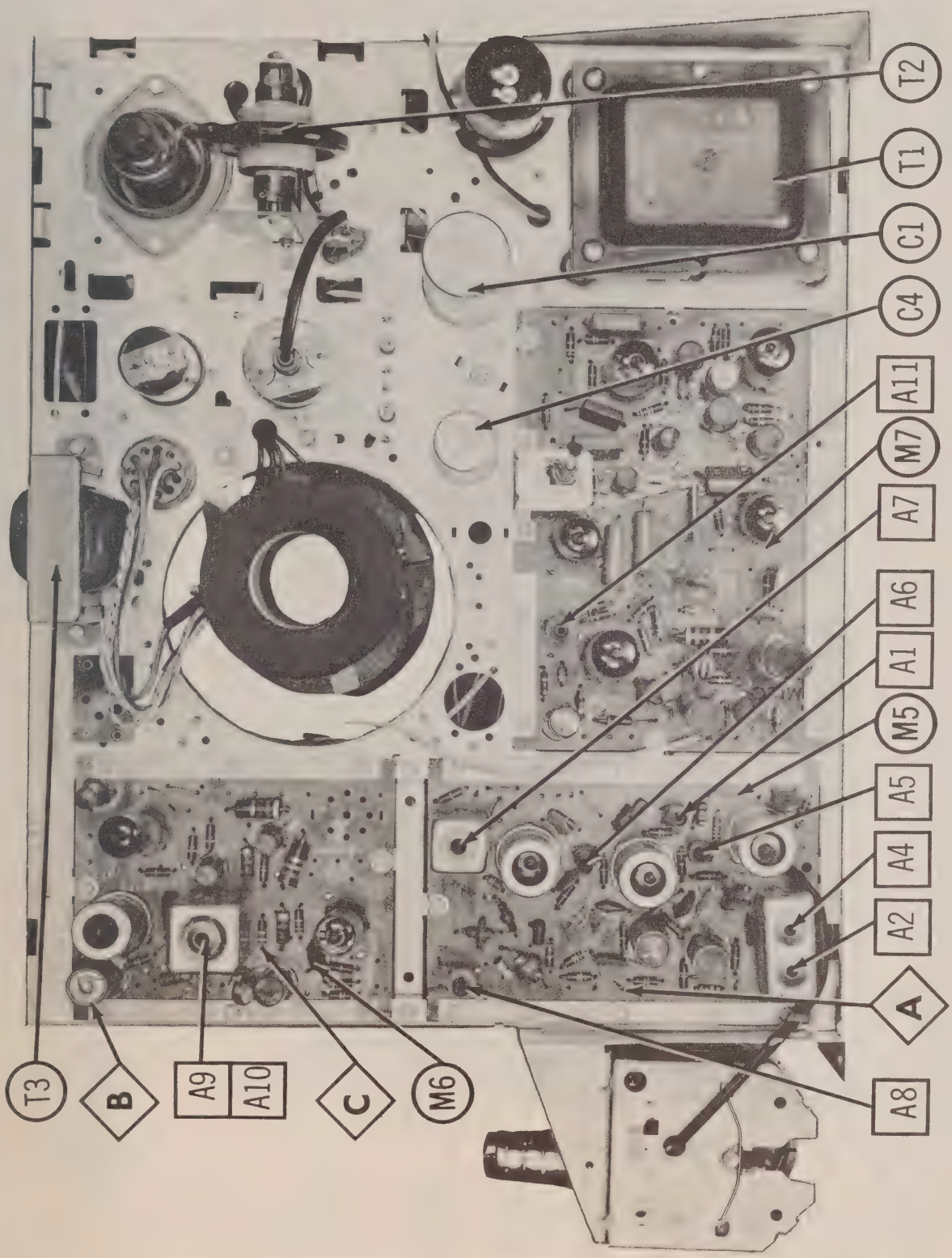
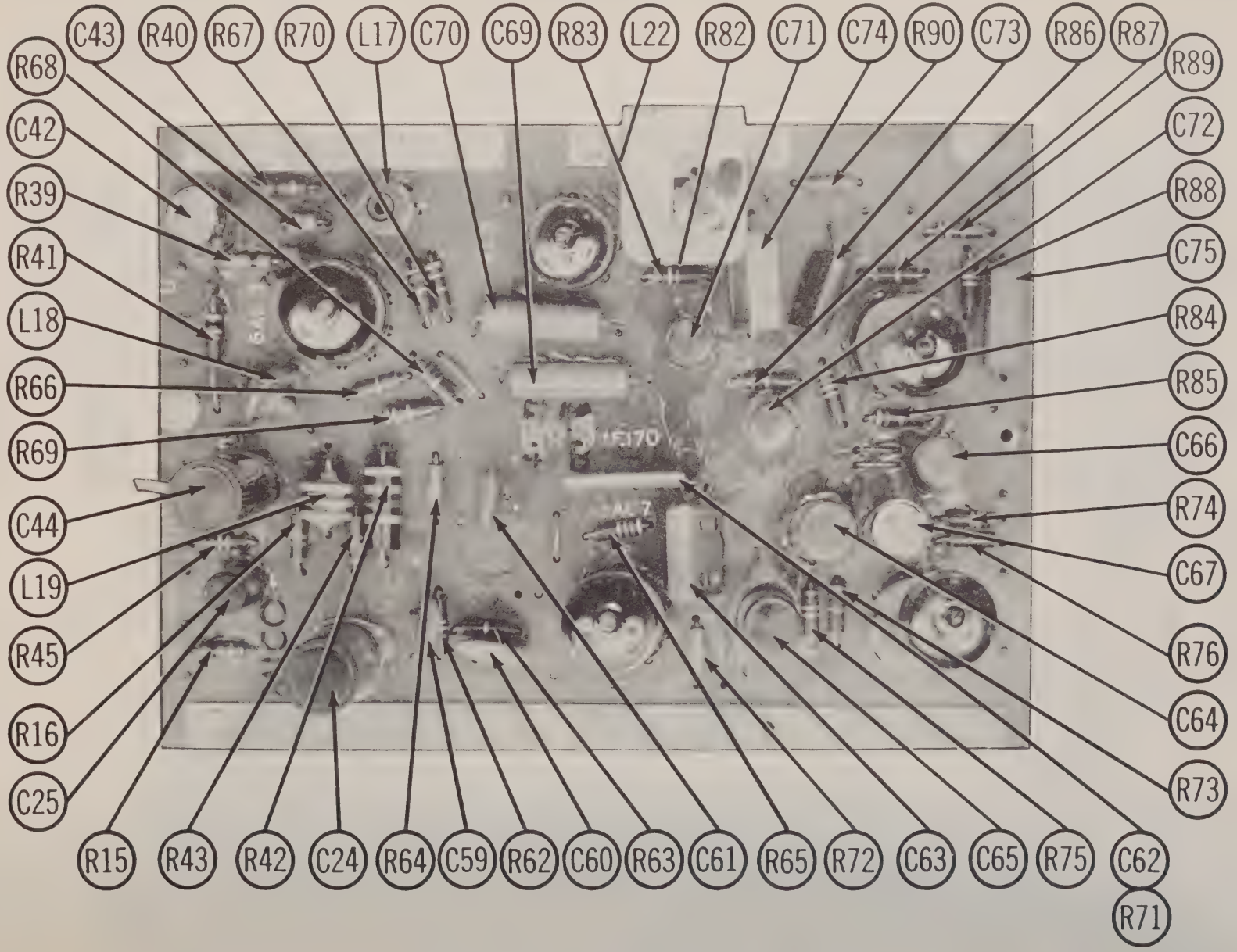


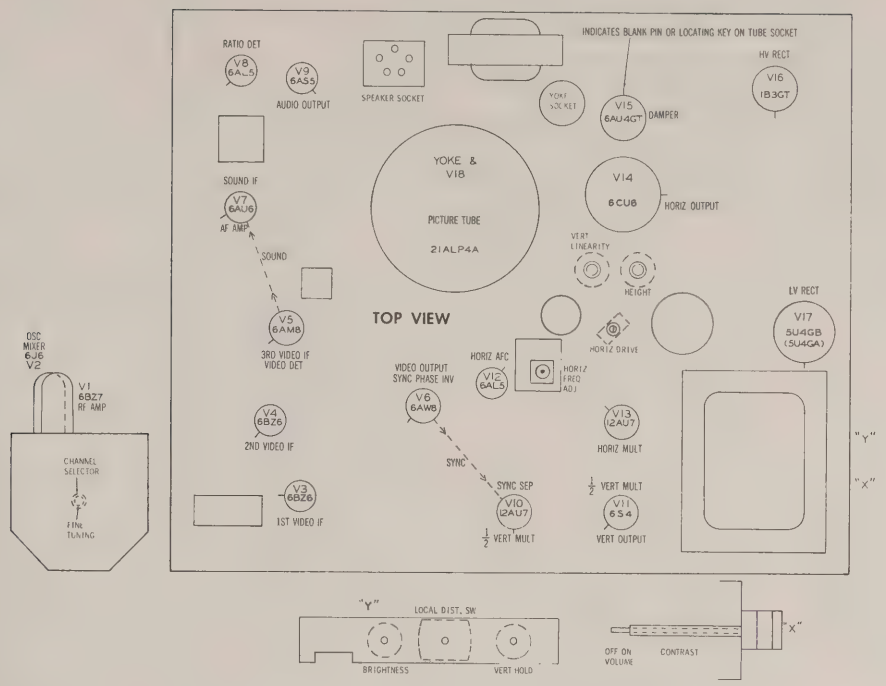
ADMIRAL CHASSIS 18Y4B,
BS, BSA, E, EA, EF, ES, ESA, L, LS

CHASSIS TOP VIEW



SYNC CIRCUIT-SUB-CHASSIS

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V17, Fuse (M1)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V9
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V18
Has pic, no sound - V7, V8, V9

SYNC FAILURE
No vert. sync - V6, V10, V11
No horiz. sync - V6, V12, V13
No vert. or horiz. sync - V6, V10

SWEEP FAILURE
No raster, has sound - V13, V14, V15, V16, V18
No vertical deflection - V10, V11
Poor vert. linearity or foldover - V10, V11
Poor horiz. linearity or foldover - V13, V14, V15
Narrow picture - V13, V14, V15, V16, V17
Vert. off freq. - V6, V10, V11
Horiz. off freq. - V6, V12, V13

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped away from the chassis.
Do not remove the horizontal Multivibrator tube (V13) to disable the high voltage.
Allow 15 minute warm-up period for receiver and test equipment.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and replace with a 6J6 with pin 1 removed.
Disconnect antenna and short antenna terminals with short clip lead.
Set the contrast control for MINIMUM contrast.
Connect the negative lead of a 3 volt bias supply to the ungrounded side of C26. Connect the positive lead to chassis.
Use only enough generator output to provide usable indication on VTVM. 1 volt maximum.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to floating tube shield over converter tube (V2). Low side to chassis.	21.25MC (Unmod.)	Any non-interfering channel	High side to point Ⓐ thru decoupling network (Fig. 1). Common to chassis.	A1	Adjust for MINIMUM deflection.
2.	"	"	27.25MC	"	"	A2	"
3.	"	"	22.6MC	"	"	A3	Adjust for maximum deflection.
4.	"	"	26.5MC	"	"	A4	"
5.	"	"	25.3MC	"	"	A5	"
6.	"	"	22.3MC	"	"	A6	"
7.	"	"	23.75MC	"	"	A7	"

OVERALL VIDEO IF RESPONSE CHECK

Leave bias connected as under "Video IF Alignment".
Use only enough sweep generator output to provide usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Direct	High side to floating tube shield floating over converter tube. Low side to chassis.	23.0MC (7MC Swp.)	21.25MC 22MC 23MC 25MC 25.75MC	Any non-interfering channel	Vert. amp. thru decoupling network (Fig. 1). Low side to chassis.		Check for response similar to Fig. 2. If necessary, retouch A1 thru A7 to obtain desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
9.	.01MFD	High side to pin 8 (plate) of 6AM8 (V5). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe to point Ⓑ. Common to chassis.	A8, A9	Keep generator output low and adjust A8 and A9 for maximum deflection.
10.	"	"	"	"	DC probe to point Ⓒ. Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60% modulation and 450KC sweep. Use 120% sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	.01MFD	High side to pin 8 (plate) of 6AM8 (V5). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. amp. to point Ⓑ. Low side to chassis.	A8, A9	Disconnect stabilizing capacitor C2. Adjust for curve of maximum amplitude and symmetry as in Fig. 3.
10.	"	"	"	"	"	Vert. amp. to point Ⓒ. Low side to chassis.	A10	Reconnect C2. Adjust so that 4.5MC marker occurs at center of crossover lines as in Fig. 4. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.

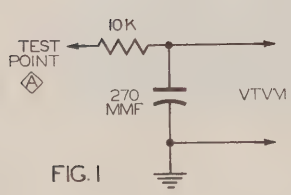


FIG. 1

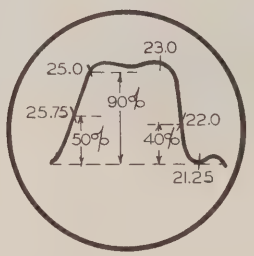


FIG. 2

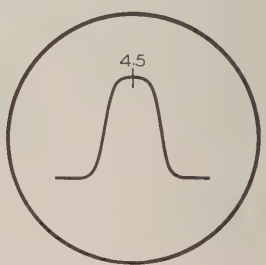


FIG. 3

ALIGNMENT INSTRUCTIONS (cont)

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
11.	.01MFD	High side to pin 8 (plate) of 6AM8 (V5). Low side to chassis.	4.5MC (Unmod.)	Any	DC probe to point Ⓑ. Low side to chassis.	All	Connect a jumper across L15 and adjust for MINIMUM deflection.

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
The channel oscillator adjustment screws are reached through a hole just above the channel switch shaft.
The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Leave bias connected as under "Video IF Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp.)	211.25MC 215.75MC	13	Vert. Amp. to point Ⓐ. Thru decoupling network (Fig. 1). Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 5. Video marker should be at 50%.
			207MC (10MC Swp.)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp.)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp.)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp.)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp.)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp.)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp.)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp.)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp.)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp.)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp.)	55.25MC 59.75MC	2		A23	

RF AND MIXER ALIGNMENT

Connect the negative lead of a 3 volt bias supply to the ungrounded side of C24. Connect the positive lead to chassis.
If a usable indication cannot be obtained on the scope, remove the bias supply and short the ungrounded side of C24 to chassis with a short jumper.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
13.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	195MC (10MC Swp.)	193.25MC 197.75MC	10	Vert. amp. thru 10KΩ to point Ⓓ. Low side to chassis.	A24, A25, A26	Adjust for response curve similar to Fig. 6 with markers above 90%.
14.	"	"	213MC (10MC Swp.)	211.25MC 215.75MC	13	"		Check each channel for response similar to Fig. 6. If markers fall below 70% on any channel, make compromise adjustment of A24, A25, and A26 with channel switch set to that channel. Recheck all other channels to see that they have not been seriously affected.
			207MC (10MC Swp.)	205.25MC 209.75MC	12			
			201MC (10MC Swp.)	199.25MC 203.75MC	11			
			189MC (10MC Swp.)	187.25MC 191.75MC	9			
			183MC (10MC Swp.)	181.25MC 185.75MC	8			
			177MC (10MC Swp.)	175.25MC 179.75MC	7			
			85MC (10MC Swp.)	83.25MC 87.75MC	6			
			79MC (10MC Swp.)	77.25MC 81.75MC	5			
			69MC (10MC Swp.)	67.25MC 71.75MC	4			
			63MC (10MC Swp.)	61.25MC 65.75MC	3			
			57MC (10MC Swp.)	55.25MC 59.75MC	2			

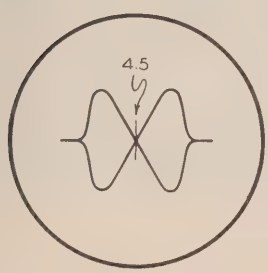


FIG. 4

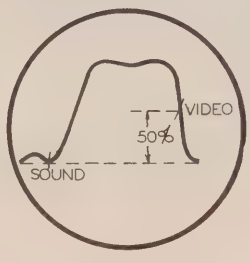


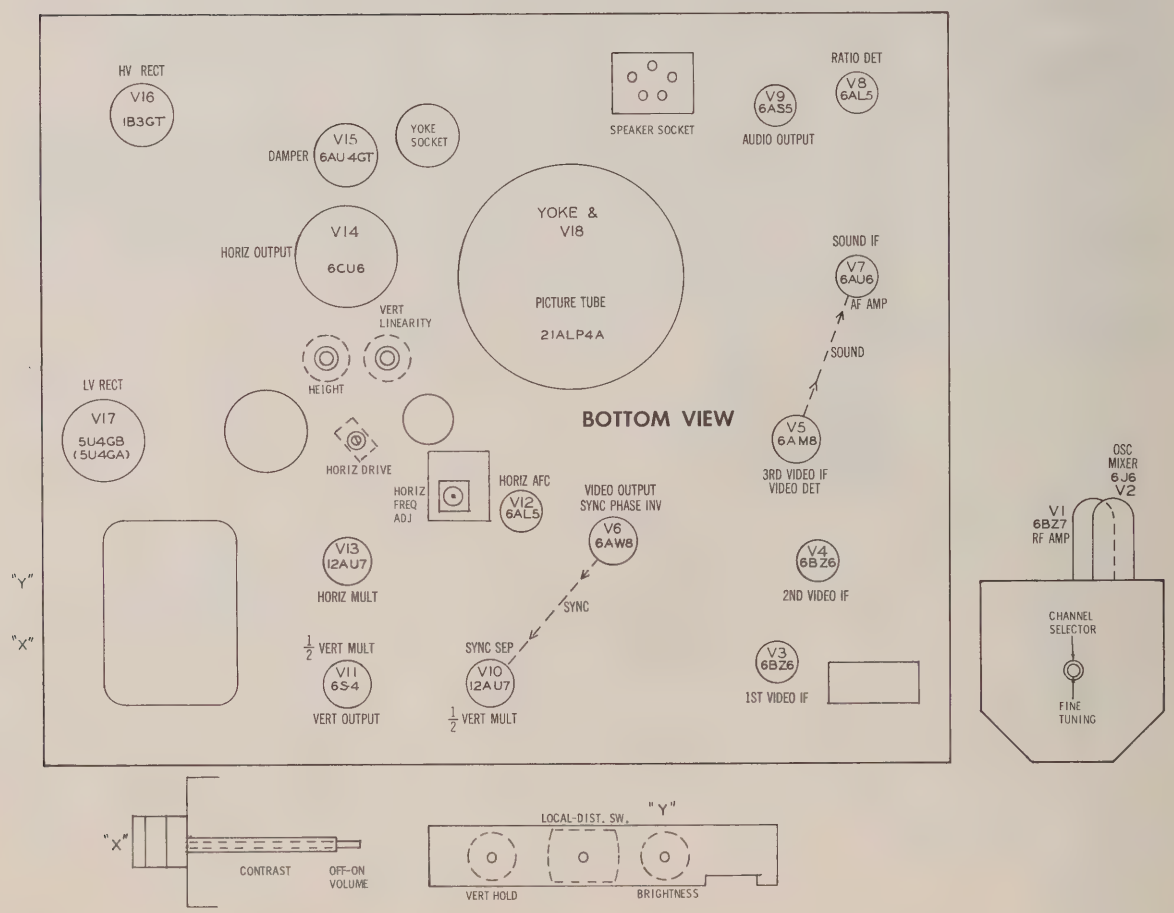
FIG. 5

FIG. 6

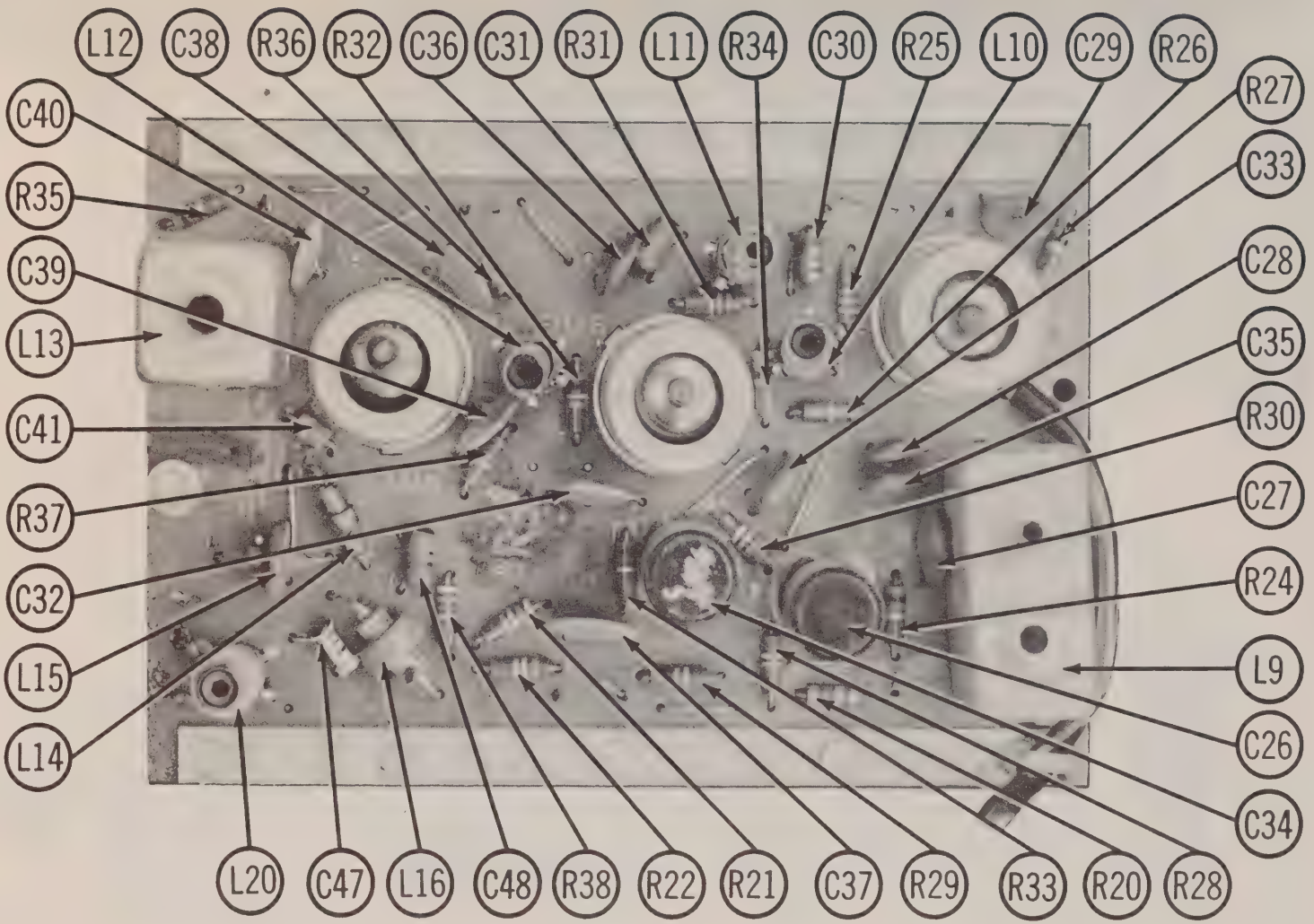
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	INF	1. 2Meg	0Ω	0Ω	. 1Ω	† 3. 3KΩ	330KΩ	INF	0Ω
V 2	6J6	■ 11KΩ	■ 8. 7KΩ	0Ω	. 1Ω	220KΩ	10KΩ	0Ω		
V 3	6BZ6	300KΩ	56Ω	0Ω	. 1Ω	▲ 1KΩ	▲ 1KΩ	0Ω		
V 4	6BZ6	110KΩ	140KΩ	. 1Ω	0Ω	† 1KΩ	† 1KΩ	140KΩ		
V 5	6AM8	120Ω	. 4Ω	■ 8. 2KΩ	0Ω	. 1Ω	† 1KΩ	. 3Ω	4. 7KΩ	0Ω
V 6	6AW8	3. 3KΩ	1. 5Meg	† 11KΩ	. 1Ω	0Ω	200Ω	1Meg	■ 30KΩ	† 4. 7KΩ
V 7	6AU6	90K Ω	0Ω	. 1Ω	0Ω	† 27KΩ	■ 330Ω	220Ω		
V 8	6AL5	INF	INF	. 1Ω	0Ω	10KΩ	0Ω	10KΩ		
V 9	6AS5	50KΩ	370KΩ	. 1Ω	0Ω	370KΩ	† 500Ω	† 750Ω		
V 10	12AU7	▲ 3Meg	220KΩ	200KΩ	0Ω	0Ω	† 100KΩ	2. 2Meg	0Ω	. 1Ω
V 11	6S4A	NC	1. 7KΩ	1. 5Meg	0Ω	. 1Ω	1. 5Meg	NC	NC	▲ 6. 5KΩ
V 12	6AL5	15Ω	15Ω	. 1Ω	0Ω	4. 8Meg	0Ω	4. 8Meg		
V 13	12AU7	† 5. 6KΩ	5Meg	1. 5KΩ	. 1Ω	. 1Ω	† 82KΩ	150KΩ	1. 5KΩ	0Ω
V 14	6CU6	TP	. 1Ω	TP	■ 1. 1KΩ	470KΩ	TP	0Ω	0Ω	▲ 16Ω
V 15	6AU4GT	NC	TP	500KΩ	NC	† 59Ω	NC	. 1Ω	0Ω	
V 16	1B3GT		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲ 490Ω
V 17	5U4GB	NC	60KΩ	NC	26Ω	NC	24Ω	NC	60KΩ	
V 18	21ALP4A	. 1Ω	56KΩ	PIN 6 0Ω	PIN 10 ▲ 5. 6KΩ	PIN 11 ■ 230KΩ	PIN 12 0Ω			

† MEASURED FROM PIN 2 OF V17.
■ MEASURED FROM 145V LINE.
▲ MEASURED FROM PIN 7 OF V4.
▲ MEASURED FROM PIN 3 OF V15.
TP-TIE POINT.
NC-NO CONNECTION.

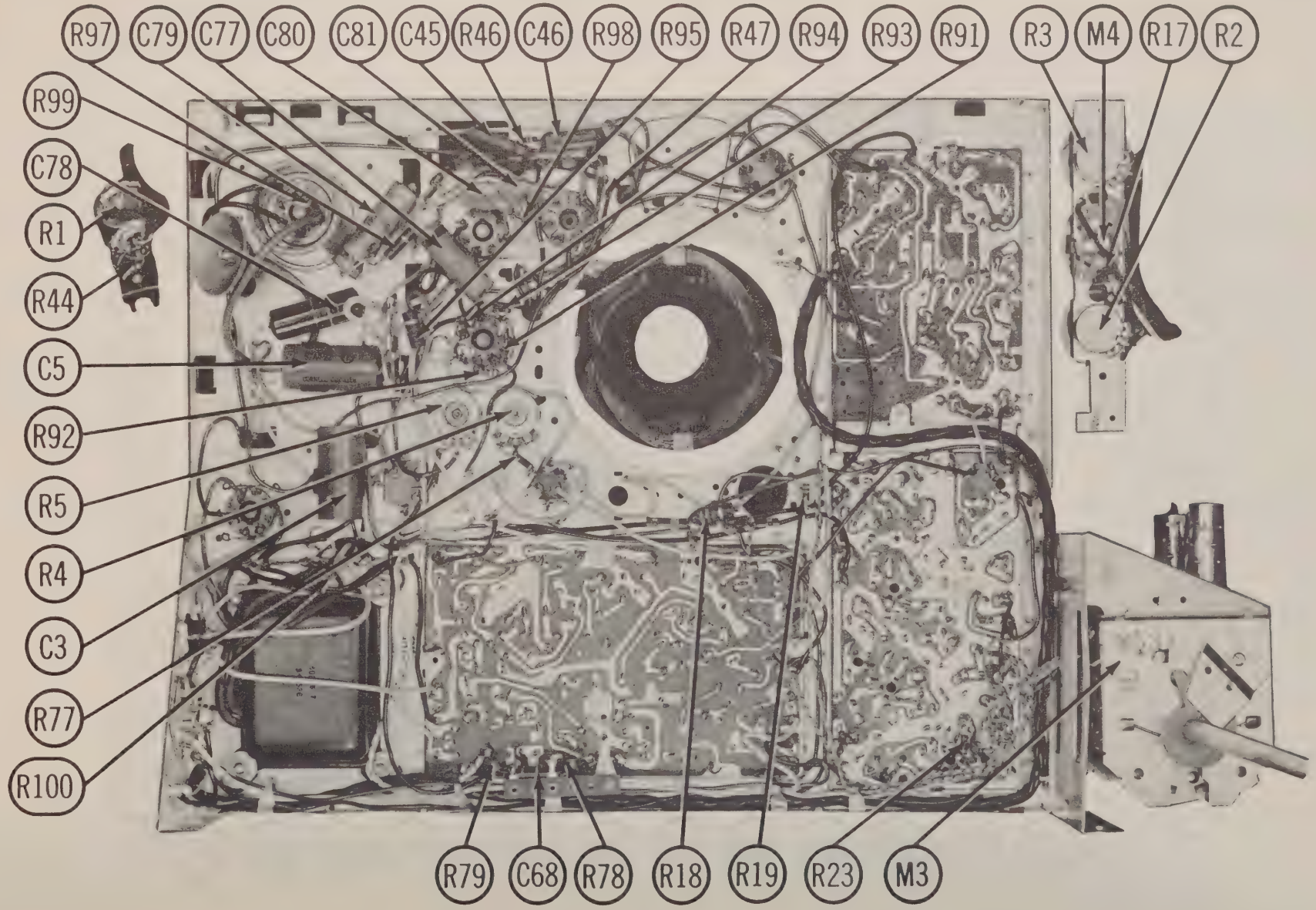


TUBE PLACEMENT CHART

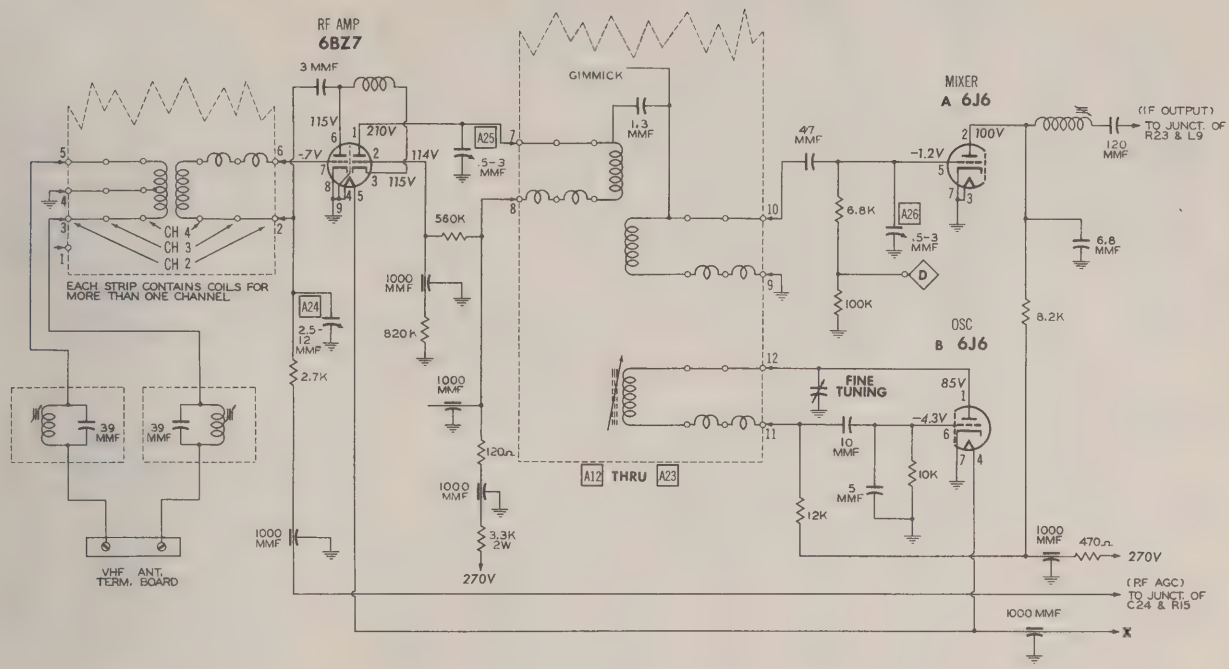


VIDEO IF-SUB-CHASSIS

ADMIRAL CHASSIS 18Y4B,
B5, B5A, E, EA, EF, E5, E5A, L, L5



CHASSIS BOTTOM VIEW CAPACITOR & RESISTOR IDENT.



VHF TUNER 94D100 USED WITH CHASSIS 18Y4BSA, AND 18Y4ESA

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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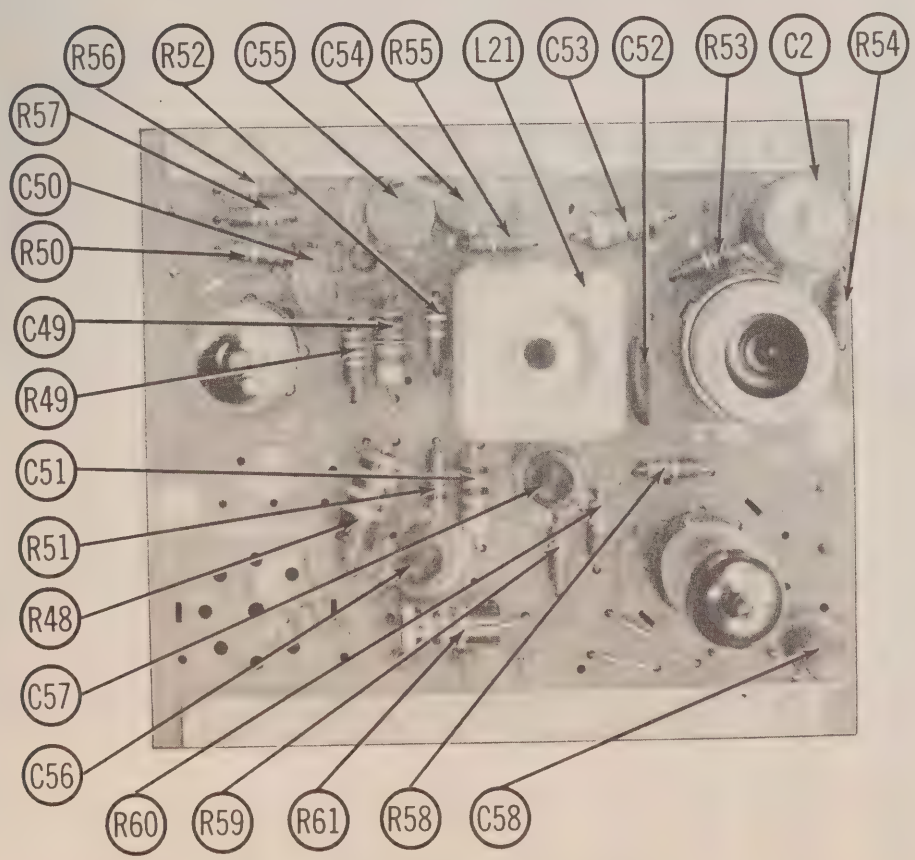
ALTERNATE VHF TUNER SCHEMATIC



SOUND IF - SUB CHASSIS

SET 320 FOLDER 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	REPLACEMENT DATA: ADMIRAL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	NOTES
V1	RF Amplifier	6BZ7	6BZ7	
V2	Mixer-Oscillator	6J8	6J8	
V3	1st. Video IF Amplifier	6BZ6	6BZ6	
V4	2nd. Video IF Amplifier	6BZ6	6BZ6	
V5	3rd. Video IF Amplifier-Video Detector	6AM8	6AM8	
V6	Video Output - Sync Phase Inverter	6AW8	6AW8	
V7	Sound IF Amplifier - AF Amplifier	6AU8	6AU8	
V8	Ratio Detector	6AL5	6AL5	
V9	Audio Output	6AB5	6AB5	
V10	Sync Separator-Vert. Mult.	12AU7	12AU7	
V11	Vert. Mult.-Vert. Output	6B4A	6B4A	
V12	Horiz AFC	6AL5	6AL5	
V13	Horiz. Mult.	12AU7	12AU7	
V14	Horiz. Output	6CU6	6CU6	
V15	Damper	6AU4GT	6AU4GT	
V16	HV Rectifier	1B3GT	1B3GT	
V17	LV Rectifier	5U4GB	5U4GB	5U4GA may be used in some versions

CATHODE-RAY TUBE

ITEM No	REPLACEMENT DATA: ADMIRAL PART No	CBS PART No	GENERAL ELECTRIC PART No	SYLVANIA PART No	NOTES
V18	21ALP4A ①	21ALP4A ①	21ALP4A ①	21ALP4A ①	① Aluminized ② Silver screen "85"
			21ALP4A B ②	B ②	
		21ALP4B ①			
		21ALP4	21ALP4		

ELECTROLYTIC CAPACITORS

ITEM No	RATING: CAP	RATING: VOLT	REPLACEMENT DATA: ADMIRAL PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	450	350	67D15-110	AFH3-39-25		FP350-8	TM-3030	T-180	R3074 *
B	400	350						MMT-4520	
C2	4	50	67B27-3	PRS350Y4	BR350	TC30	TD-4-50	MMT-0505	TVA-1303
C3	40	200	67A4-21	PRS250Y40	BH4025	TC56	TD-40-250	FM-3540	TVA-1511
C4A	450	200	67D15-109	AFH3-38		FP217.8	TM-3123	T-395	R1652 *
B	45	200				TC50X		MMT-4504	
C	20	50							
C5	10	475	67A4-22	PRS500V10	BR1250	TC82	TD-10-475	MT-4710	TVA-1802

* Unit must be ordered from manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No	RATING: CAP	RATING: VOLT	REPLACEMENT DATA: ADMIRAL PART No	AEROVOX PART No	CENTRALAB PART No	CORNELL-DUBILIER PART No	ERIE PART No.	MALLORY PART No	SPRAGUE PART No	NOTES
C6	1			NPO-S11	TCZ-1	TZ03	NPO2A-010		5TCCB-V1	
C7	6.8		94D47-53	NPO-D18-8	TCZ-6R8	Z012	NPO2A-6R8	Z7T-5566	5TCCB-V68	
C8	6.8		94D47-53	NPO-D18.8	TCZ-6R8	Z012	NPO2A-6R8	Z7T-5568	5TCCB-V68	
C9	2-10		94D92-71							
C10	300		94D92-70	EF-001	MFT-1000				503C-D1	
C11	2.2		94D92-75	NPO-S12 2	TCZ-2R2	Z006	NPO2A-2R2		5TCCB-V22	
C12	1000		94D91-64	DD-102	CD-102	K069	801-001	DC-521	5HK-D1	
C13	5-3		94D92-72		829-3		3139-01-0R5	CT565A		
C14	2000		94D92-70	EF-001	MFT-1000				503C-D1	
C15	90		94D92-78	EF-00005	MFT-50					
C16	5-3		94D92-72		829-3		3139-01-0R5	CT565A		
C17	18									
C18	10									
C19	1000		94D91-64	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C20	8.2		94D92-74	NPO-D18 2		Z016	NPO2A-8R2			
C21	120		85C5-56	DD0002	DD-121	G044	811-121	UC-5312	5GA-T12	
C22	900		94D92-70	EF-001	MFT-1000				503C-D1	
C23	900		94D92-70	EF-001	MFT-1000				503C-D1	
C24	.22	200	64B8-51					PT34022	22E-P22	
C25	.01	200	64B10-50	BPD-01	DD-103	K062	811-01	PT8411	22E-S10	
C26	.33	200	64B16-50						22E-P33	Note 2
C27	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C28	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C29	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C30	3.3		85C5-59	NPO-S13 3	TCZ-3R3	TZ06	NPO2A-3R3	Z7T-5533	5TCCB-V33	
C31	22		85C5-13	NPO-S22	TCZ-22	TZ16	NPO2K-220		5TCCC-Q22	
C32	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C33	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C34	22	200	64B16-51					PT34022	22E-P22	
C35	1000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C36	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C37	10000		85C43-2	BPD-010	DD-503	K082	811-01	DC-521	5HK-D1	
C38	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C39	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C40	5000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C41	.01	1200	85B28-068	NPO-S18 1	TCZ-6R8	TZ09	NPO2A-6R8	Z7T-5568	5TCCB-V68	
C42	.1	200	64B16-53					PT8401	22E-P1	
C43	6.8		85B29-098	NPO-S18.8	TCZ-6R8	TZ09	NPO2A-6R8	Z7T-5568	5TCCB-V68	
C44	22	400	64B16-38					PT34022	40E-P22	
C45	0068	600	64B9-15	BPD-0068	DS-682	CUBSD68	GP3-333-682	PT8268	6TM-D68	
C46	01	600	64B9-13	BPD-01	DS-103	CUBS61	GP3-333-103	PT611	6TM-S1	
C47	10		85C5-44	NPO-S10	TCZ-10	TZ09	NPO2A-100	Z7T-541	5TCCC-Q1	
C48	20		85C5-51	NPO-S120	TCZ-20	TZ13	NP0K-200	Z7-542	5TCC-Q2	
C49	1000		85C39-1	EM000	DS-102	TP52	GP2L-102	UC-521	5HK-D1	
C50	1000		85C43-1	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C51	1000		85C39-1	EM000	DS-102	TP52	GP2L-102	UC-521	5HK-D1	
C52	100		85D10-53							
C53	500		85C39-2	EM500	DS-501	TP47	811-501	UC-535	5GA-T5	
C54	.022	600	64B16-42	BPD-001	DD-103	K069	801-001	PT8421	6SE-D10	
C55	.047	200	64B16-55	BPD-05				PT8147	22E-S47	
C56	.01	400	64B16-36	BPD-01	DD-103	K062	811-01	PT611	40E-S1	
C57	.01	600	64B16-38	BPD-01	DD-103	K062	811-01	PT8411	6SE-S1	
C58	.0047	600	64B16-15	BPD-0047	DD-472	K079	811-0047	DC-525	6SE-D47	
C59	150		85D20-86	N750-E150	TCH-150	TH26	N750-327-151		5TCU-T15	
C60	10000		85C43-3	BPD-01	DD-103	K062	811-01	DC-571	5HK-S1	
C61	5000		85D20-5	BPD-005	DD-502	K080	811-005	DC-535	5HK-D5	
C62A	2000							DC-535		
B	5000		98DC9-1	TPA-152	TPC-500	TZ527M1	71405-01	DC-535	YY-1	
C	5000							DC-535		

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ADMIRAL Part No	AEROVOX Part No.	CENTRALAB Part No	CORNELL-DUBILIER Part No.	ERIE Part No.	MALLORY Part No	SPRAGUE Part No.	NOTES
C63	2200	500	85B21-223	1464-0022		1N5022			MS-222	
C64	.033	600	64B15-10	BPD-03					68E-S33	
C65	.047	400	64B15-32	BPD-05				PT8147	42E-S47	
C66	.033	200	64B15-56	BPD-03					22E-S33	
C67	.047	600	64B15-9	BPD-05					68E-S47	
C68	.01	1600	64A2-28	P1688N-01	DD16-103	CUBS681		PT611	16TM-S1	
C69	.001	400	64B21-1	BPD-001	D6-102	CUBSD1	GP2L-102	PT621	6TM-D1	
C70	.001	400	64B21-1	BPD-001	D6-102	CUBSD1	GP2L-102	PT621	6TM-D1	
C71	.0047	400	64B15-38	BPD-0047	D6-472	K079	811-0047	PT84347	42E-D47	
C72	.015	200	64B15-58	BPD-015	DD16-153				22E-S15	
C73	.390	500	64B21-391		D6-381	5R5739	811-391		MS-339	
C74	3900	500	64B21-392	1464-0039		1R5D39			MS-239	
C75	680	500	64B21-681	1464-0006@	D6-681	1R5T68	811-681		MS-368	
C76	4700			BPD-0047	D6-472	CUBSD47	GP3-333-472	UC-5347	6TM-D47	Note 1
C77	.047	600	64B9-9	BPD-05	DF-503	CUBS647		PT8147	6TM-S47	
C78	.1	600	64B9-7	P888N-1	DF-104	CUBS6P1		PT601	6TM-P1	
C79	.047	1000	64A3-30	P1068N-047		CUBS685		PT1618	10TM-S47	
C80	230	3000	85D10-89							
C81	150	3000	85D10-88	HVD-30-150	DD30-151	V3T15	3KV-151		30GA-T15	

† Items C62A, C62B, C62C, R71A, R71B and R71C are combined in one unit.
Note 1. Not used in some versions.
Note 2. Some versions use a .22MMF capacitor in this application.

CONTROLS

ITEM No	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: ADMIRAL PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1000Ω	½	75B11-38	F1-3	RTV-551	* QJ-554	UK548	Contrast (Panel)
B	1Meg	½		R3-54				Volume (Rear)
C	Switch			KB-1				Attach to R1B.
R2A	100KΩ	½	75C13-53	AB-40	A47-100K-S	Q11-128	U-41	Brightness
B	Shaft		Not Req.	AK-4	KS8-3	Not Req.	Not Req.	Attach to R2A.
R3A	200KΩ	½	75C13-85	AB-46	A47-200K-S	Q11-129	U-43	Vert. Hold
B	Shaft		Not Req.	AK-4	KS8-3	Not Req.	Not Req.	Attach to R3A.
R4A	3000Ω	½	75C20-7	AB-8	A47-3000-S	Q11-13	U-8	Vert. Linearity
B	Shaft		Not Req.	AK-1	FK8-½	RQ	Not Req.	Attach to R4A.
R5A	2.5Meg	½	75C20-1	BX-83	A47-2.5Meg-S	Q11-339	SU-565	Height
B	Shaft		Not Req.	Not Req.	FK8-½	RQ	Not Req.	Attach to R5A.

* Concentrikit Equivalent: K-7 Kit, Base Elements & Shafts; Bi7-108 & P17-300 (Panel), Bi3-137 & R2-318 (Rear), 78-1 (Switch)

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ADMIRAL PART No.	IRC PART No.	NOTES
R6	680KΩ	½	60B8-684	BTS-680K	
R7	4700Ω	½	60B8-472	BTS-4700	
R8	820KΩ	½	60B8-824	BTS-820K	
R9	560KΩ	½	60B8-564	BTS-560K	
R10	220KΩ	½	60B8-224	BTS-220K	
R11	10KΩ	½	60B8-103		
R12	10KΩ	½	60B8-103	BTS-10K	
R13	8200Ω	½	60B8-822	BTS-8200	
R14	82KΩ	½	60B8-823	BTS-82K	
R15	1Meg	½	60B8-105	BTS-1Meg	
R16	15Meg	½	60B8-156	BTS-15Meg	
R17	180Ω	½	60B8-181	BTS-180	
R18	330KΩ	2	60B20-332	BTS-330K	
R19	470Ω	½	60B8-471	BTS-470	
R20	820KΩ	½	60B8-824	BTS-820K	
R21	470KΩ	½	60B8-474	BTS-470K	
R22	270KΩ	½	60B8-274	BTS-270K	
R23	1000Ω	½	60B8-102	BTS-1000	Note 1
R24	1000Ω	½	60B8-102	BTS-1000	
R25	13KΩ 5%	½	60B7-133		Note 2
R26	1000Ω	½	60B8-102	BTS-1000	
R27	58Ω	½	60B8-580	BTS-58	
R28	230KΩ	½	60B8-234		
R29	220KΩ	½	60B8-224		
R30	27KΩ	½	60B8-273		
R31	27KΩ	½	60B8-273		
R32	10KΩ 5%	½	60B7-103		
R33	1000Ω	½	60B8-102	BTS-1000	
R34	47Ω	½	60B8-470	BTS-47	
R35	1000Ω	½	60B8-102	BTS-1000	
R36	8200Ω	½	60B8-822	BTS-8200	Note 3
R37	120Ω	½	60B8-121	BTS-120	
R38	4700Ω	½	60B8-472	BTS-4700	
R39	100Ω	½	60B8-101	BTS-100	
R40	1Meg	½	60B8-105	BTS-1Meg	
R41	30KΩ 5%	1	60B7-303	BTS-30K 5%	
R42	4700Ω	2	60B20-472	BTS-4700	
R43	15KΩ	½	60B8-153	BTS-15K	
R44	470Ω	½	60B8-471	BTS-470	
R45	180KΩ	½	60B8-184	BTS-180K	
R46	56KΩ	½	60B8-563	BTS-56K	
R47	2700Ω	½	60B8-272	BTS-2700	
R48	27KΩ	2	60B20-273	BTS-27K	
R49	330Ω	½	60B8-331	BTS-330	
R50	220Ω	½	60B8-221	BTS-220	
R51	10KΩ	½	60B8-103	BTS-10K	
R52	390Ω	½	60B8-391	BTS-390	
R53	10KΩ	½	60B8-103	BTS-10K	
R54	10KΩ	½	60B8-103	BTS-10K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ADMIRAL PART No.	IRC PART No.	NOTES
R55	2200Ω	½	60B8-222	BTS-2200	
R56	47KΩ	½	60B8-473	BTS-47K	
R57	33KΩ	½	60B8-393	BTS-33K	
R58	150Ω	½	60B8-151	BTS-150	
R59	820KΩ 5%	½	60B7-824	BTS-820K 5%	
R60	680KΩ 5%	½	60B7-684	BTS-680K 5%	
R61	470Ω	2	60B20-471	BTB-470	
R62	270KΩ	½	60B8-274	BTS-270K	
R63	2.2Meg	½	60B8-225	BTS-2.2Meg	
R64	220KΩ	½	60B8-224	BTS-220K	
R65	47KΩ	½	60B8-473	BTS-47K	
R66	2.2Meg	½	60B8-225	BTS-2.2Meg	
R67	4.7Meg	½	60B8-475	BTS-4.7	
R68	6800Ω	½	60B8-682	BTS-6800	
R69	3300Ω	½	60B8-332	BTS-3300	
R70	33000Ω	½	60B8-333	BTS-33K	
R71A	22K		† 63C9-1	BTS-22K	
B	8200Ω			BTS-8200	
C	62000Ω			BTS-62K	
R72	220KΩ	½	60B8-224	BTS-220K	
R73	1.8Meg	½	60B8-185	BTS-1.8Meg	
R74	150KΩ	½	60B8-154	BTS-150K	Note 4
R75	15KΩ	½	60B8-153	BTS-15K	
R76	1.5Meg	½		BTS-1.5Meg	Note 5
R77	820Ω	½	60B8-821	BTS-820	
R78	100KΩ	½	60B8-104	BTS-100K	
R79	220KΩ	½	60B8-224	BTS-220K	
R80	560Ω	½			
R81	560Ω	½			
R82	100KΩ 5%	½	60B7-104		
R83	100KΩ 5%	½	60B7-104		
R84	470KΩ	½	60B8-474		
R85	4.7Meg	½	60B7-475		
R86	5600Ω	½	60B8-562		
R87	1500Ω	½	60B8-152		
R88	150KΩ	½	60B8-154		
R89	3900Ω	½	60B8-392		
R90	82KΩ	½	60B8-823		
R91	100Ω	½	60B8-101		
R92	470KΩ	½	60B8-474		
R93	100Ω	½	60B8-101		
R94	1000Ω	½	60B8-103		
R95	5600Ω	2		BTB-5600	Note 6
R96	18KΩ	2		BTB-18K	Note 6
R97	15Ω	½	60B8-52		
R98	270Ω	½	60B8-271		
R99	4.7Ω	½	60B8-4.7	BW½-4.7	
R100	470KΩ	½	60B8-474	BTS-470K	Note 7
R101	6800Ω	½		BTS-6800	Note 7
R102	68KΩ	½		BTS-68K	Note 7

Note 1. Not used in versions below run 3.
Note 2. Some versions use a 470Ω 5% ½W resistor in this application.
Note 3. Some versions use a 1200Ω ½W resistor in this application.
Note 4. A 120KΩ ½W resistor is used in models below run 2 in this application.
Note 5. Early versions use a 2.2Meg ½W resistor in this application (Part No. 60B8-225).
Note 6. Early versions use a 4700Ω 2W resistor in this application, also some versions use a 18KΩ 2W resistor with R95 added in this application.
Note 7. Not used in some versions.
† Items R71A, R71B, R71C, C62A, C62B, C62C are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: ADMIRAL PART No.	Halldorson PART No.	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No
T1	117VAC	535VCT	5V	6.3V	80C35-1	P8733	P8836 ①	P8164	26R33 ②	R-51BC ③
	@ 1.4A	@ .180A	@ 3A	@ 8.6A						

① Tape 6.3V @ 1.25A winding.
② Tape low HV winding. Tape 5V @ 3A winding. Parallel and phase 6.3V @ 5A windings.
③ Parallel and phase 6.3V @ 5A windings tape 6.3V @ 1.2A winding.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T3	Horiz. Output Trans.	78D65-1	FB420 *					FLY-77 *	D-49 *
T3	Vert. Output Trans.	79D43-4	21P00X⑫	A-2824④ ⑤		V312	A-8141	26B54	A-109X⑫
T4A	Yoke(90°)Horiz. (DR.5MH)	94D87-10⑥	DF807⑦	MDF-83⑦	235D1⑦	Y90F19/43 ⑦	DY-16A ⑦	Y-16 ⑦	Y-41-1⑦
B	Vert.(37MH)	94D87-8⑥							

① Use 15 to 1 turns ratio.
② Connect as auto transformer.
③ Drill new mounting hole(s).
④ Cut and tape yellow lead.
⑤ Includes resistors R80, R81 and plug (Admiral part #68A18-3).
⑥ Alternate yoke part number.
⑦ Use original horizontal damping network.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	5	5					4	5
	6	2					3	7
	8	1					1	2
Special Notes →		⑨					⑧	⑧

⑧ Requires 2 turns for filament winding.

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No	Thordarson PART No	Triad PART No.	NOTES
T5	4.2KΩ	3-4Ω	Part of spkr. 78B101-1	21000	A3026	A3877	24S80	S-6X	

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: ADMIRAL PART No.	QUAM PART No.	RCA TYPE No	NOTES
SP1	4"	PM	3-4Ω	78B101-1 ① ③	4A07	22S81	① Includes choke and output transformer.
	4"	PM		78B105-2 ② ③	4A07	22S81	② Includes output transformer.
	6"x 9"	PM		78C108-2 ② ③	6A2	22S81	③ Used in Model 723D1D.
	6"	PM		78C111-1 ② ③	6A1	22S81	④ Used in Models C23A6, C23A7.
							⑤ Used in Models C23A1, C23A2, C23A3, C23A5.

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: ADMIRAL PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant Matching Trans.	0Ω	0Ω					
L2	Ant. Matching Trans.	0Ω	0Ω					
L3	IF Trap	.2Ω		94D 92-87				
L4A	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-53				Channel 2
B	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-53				Channel 3
C	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-54				Channel 4
D	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-55				Channel 5
E	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-56				Channel 6
F	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-57				Channel 7
G	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-58				Channel 8
H	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-59				Channel 9
I	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-60				Channel 10
J	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-61				Channel 11
K	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 92-62				Channel 12
L	Ant., RF, Mixer Grid, Osc. Coils	0Ω		94D 96-63				Channel 13
L5	Fil. Choke	0Ω		94D 92-67				
L6	Neut. Coil	0Ω		94D 92-68				
L7	RF Coil	0Ω		94D 92-69				
L8	Conv. Plate	.7Ω		94D 92-64				

ADMIRAL CHASSIS 18Y4B, BS, BSA, E, EA, EF, ES, ESA, L, LS

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	ADMIRAL PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L9A	1st. Video IF	0Ω		72C 132-6				Includes Cap.
B	27.25MC Trap	0Ω		72C 132-5				
L10	2nd. Video IF	.4Ω	.4Ω	72C 132-4				
L11	21.25MC Trap	0Ω		72C 132-3				
L12	3rd. Video IF	.4Ω	.4Ω	72C 132-2				
L13	4th. Video IF	.7Ω	.3Ω	72B 152-2				Includes .005 Cap.
L14	Series Peaking Coil	3.4Ω		73A 24-2	19-3036	TV-180	6176	35 Microhenries
L15	Series Peaking Coil	5.5Ω		73B 5-26	19-3180*	TV-184*	6180*	188 Microhenries; Wound on 4.7KΩ Resistor.
L16	Shunt Peaking Coil	17Ω		73B 5-25	19-3500		6174	505 Microhenries
L17	4.5MC Trap	4.8Ω		72C 132-1				
L18	Series Peaking Coil	8Ω		73B 5-14	19-3250■	TV-185■	6181■	250 Microhenries; Wound on 18KΩ Resistor.
L19	Shunt Peaking Coil	23Ω		73A 11-1			6156▲	790 Microhenries; Wound on 10KΩ Resistor.
L20	Sound IF	4.8Ω		72C 132-1				
L21	Ratio Det.	3.7Ω	.3ΩCT	72C 68-4				Tertiary Winding - .8Ω.

* Parallel with 4.7KΩ resistor.
■ Parallel with 18KΩ resistor.
▲ Parallel with 10KΩ resistor.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA							NOTES
	PRI.	SEC.	ADMIRAL PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	
L22	58Ω		94C17-4							

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D.C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ~)	ADMIRAL PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L23	.180A	59Ω	1HY	74B18-13	C5040 ①		C2327①	26C41 ①	C-21X

① Drill new mounting holes.

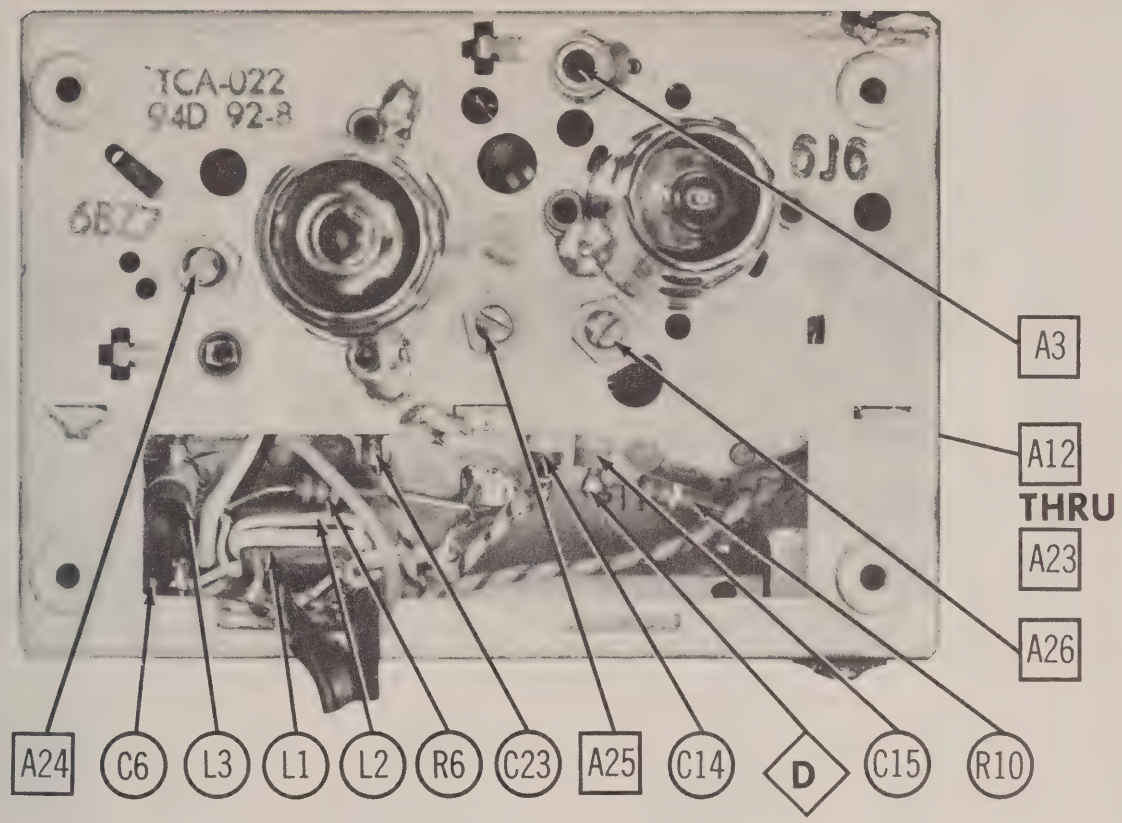
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			ADMIRAL PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1*	3AG S/B	½A 250V	84A 1-33	84A 5-4	313.500 (3AG S/B ½A)	357001	MDL½	4405

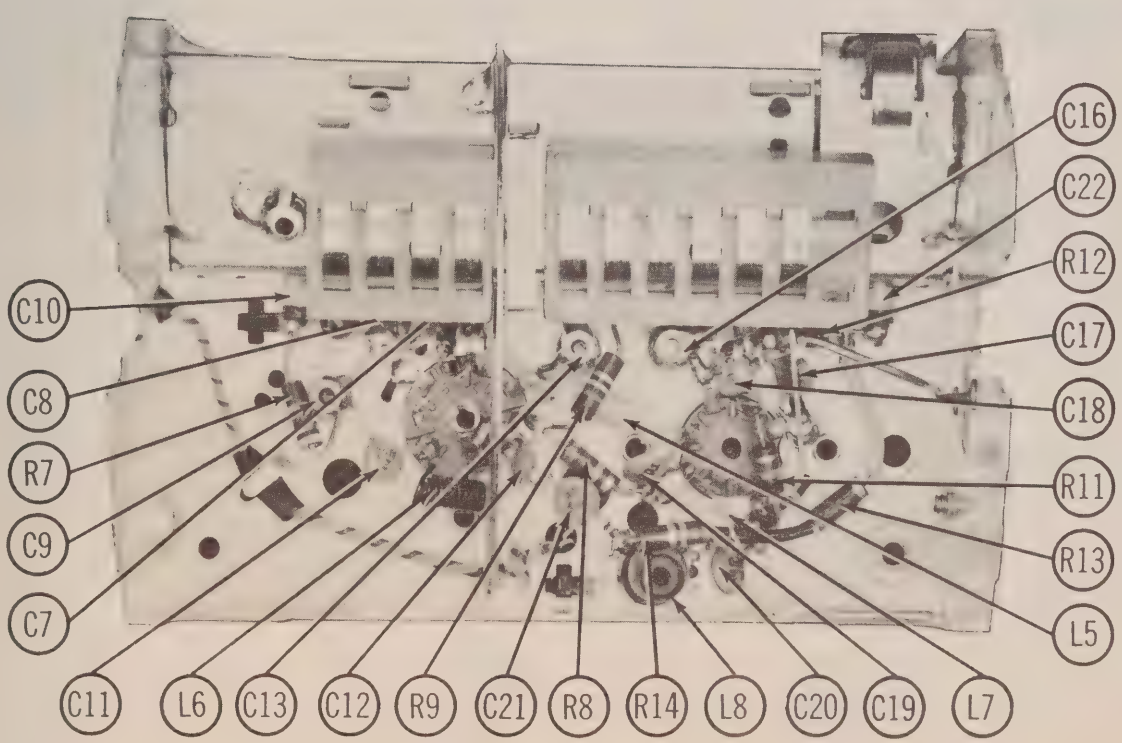
* Used in chassis stamped run 14 or higher.

MISCELLANEOUS

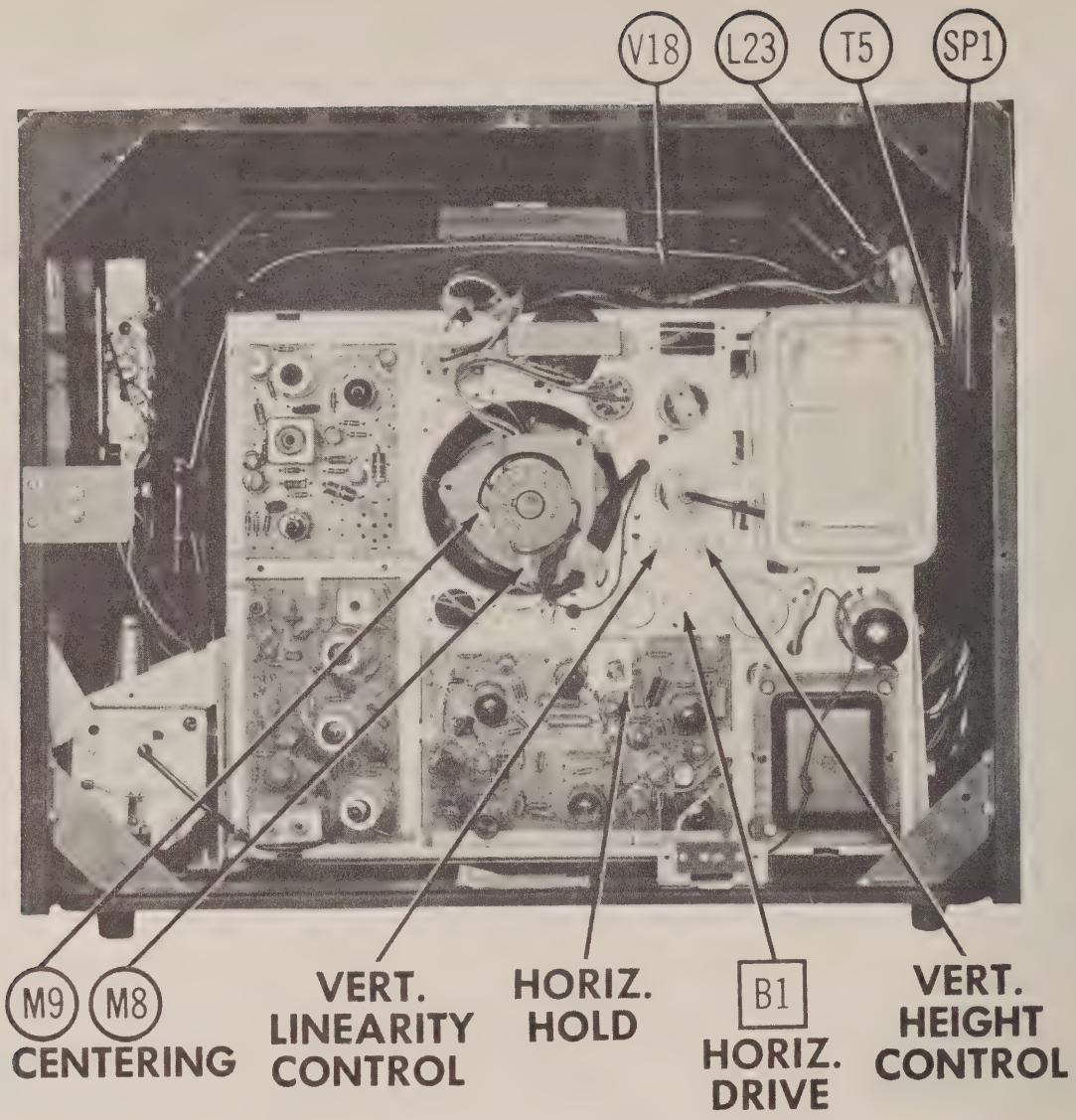
ITEM No.	PART NAME	ADMIRAL PART No.	NOTES
M2	Dial Light	81A1-12	#51; Not Used In Some Versions.
M3	Tuner	94D92-8	VHF; Used In All Chassis Except 18Y4ESA, 18Y4BSA.
	Tuner	94D100	VHF; Chassis 18Y4ESA, 18Y4BSA.
M4	Switch	76A31-1	Local-Distant (DPST - Rotary, Wafer Type) Mounted On Side Of Set. Switch Part #76A31-2 Or 76A31-3 Mounted On Front Of Set.
M5	Printed Circuit Board	A4861-2	Video IF - Chassis Stamped Run 16 Or Lower.
	Printed Circuit Board	A4961-4	Video IF - Chassis Stamped Run 17 Or Higher.
M6	Printed Circuit Board	A4862	Sound
M7	Printed Circuit Board	A4864-1	Sync - Chassis Stamped Run 16 Or Lower.
	Printed Circuit Board	A4864-2	Sync - Chassis Stamped Run 17 Or Higher.
M8	Centering Device	94A71-1	
M9	Ion Trap	94A15-4	
B1	Trimmer Cap.	66A30-3	Horiz. Drive (170 - 780MMF.).
	Cabinet	34E88-4	Models T2301D, T2301DR.
	Cabinet	35E356-2	Model C23A6
	Cabinet	35E356-3	Model C23A7
	Cabinet	35E364-1	Models C23A1, C23A1A.
	Cabinet	35E364-2	Models C23A2, C23A2A.
	Cabinet	35E364-3	Models C23A3, C23A3A.
	Cabinet	35E364-4	Models C23A8, C23A8A.
	Mask	23E222-3	Models T2301D, T2301DR.
	Mask	23E220-5	Models C23A6, C23A2, C23A2A, C23A8, C23A8A.
	Mask	23E220-2	Models C23A7, C23A3, C23A3A.
	Mask	23E220-11	Models C23A1, C23A1A
	Safety Glass	21C83-3	Models T2301D, T2301DR.
	Safety Glass	21C83-2	Models C23A6, C23A7, C23A2, C23A2A, C23A3, C23A3A, C23A8, C23A8A.
	Safety Glass	21C83-1	Model C23A1, C23A1A.



RF TUNER-TOP VIEW



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

1. Turn the set on and tune in a TV station, preferably with a test pattern.

2. Set the brightness and contrast controls for normal picture.

3. Turn the horizontal hold clockwise until the picture loses sync. It may be necessary to switch off channel and back again for picture to lose sync.

4. Turn the horizontal hold slowly counter clockwise until the picture just falls into sync.

5. Turn to an unused channel. If vertical lines appear near the center of the screen, slowly adjust the horizontal drive trimmer (B1) until white lines disappear.

6. If in step 5 the horizontal drive was adjusted, tune in a TV station and repeat steps 3 and 4. Check horizontal sync by switching off channel and back again.

AIRLINE
MODEL GAA-990A

AIRLINE
MODEL GAA-990A

TRADE NAME	Airline Model GAA-990A
SUPPLIER	Montgomery Ward & Co., 619 Chicago Ave., Chicago, Ill.
TYPE SET	AC Operated AM Superheterodyne Receiver With 3 Speed Automatic Record Changer
TUBES (Five)	Types 12BE6 Converter, 12BA6 IF Amplifier, 12AT6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-125 Volts AC-60 Cycles — RATING .23 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	535KC-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Use isolation transformer, if available, If not, connect a .1MFD capacitor in series with low side of signal generator and B-
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to chassis.	455KC (400~Mod)	Tuning gang fully closed	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1620KC	Tuning gang fully open	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal	"	A6	"

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE SIMILAR V-M MODEL 954B-PHOTOFACT SET #302-FOLDER 12

PHOTOFACT CO.
L. F. [illegible] WORKSHIP
3924 [illegible] ST.
DENVER, COLORADO

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

AIRLINE
Model GAA-990A

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA		NOTES
		AIRLINE PART No.	STANDARD REPLACEMENT	
V1	Converter	12BE6	12BE6	
V2	IF Amplifier	12BA6	12BA6	
V3	Det.-AVC-AF Amplifier	12AT6	12AT6	
V4	Output	50C5	50C5	
V5	Rectifier	35W4	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	AIRLINE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	150	1019	E58C34	BBRQ44315C				R2199 †
B	40	150							
C	20	150							
D	20	25							
C2	2	50	830 (Note 1)	RE1034	BBRT4-50T * / BBRT4-50T	TC30 * / TC30		MT-1504 * / MT-1504	R2198 †

Note 1. Non-polarized unit.
* Connect negative leads together.
† Unit must be ordered from Mfgr.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	AIRLINE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C4	.1	200		P288N-1	DF-104	CUB2P1		PT401	2TM-P1	
C5	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C6A	220									
B	5000									
C	5000		♦827	♦PA-113-2	♦PC-151	♦116TM2	♦1408-02		♦DT-2	
D	250									
E										
C7	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C8	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C9	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C10	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C11	.1	600		P688N-1	DF-104	CUB6P1		PT601	6TM-P1	

♦ Items C6A, C6B, C6C, C6D, C6E, R10A, R10B and R10C are combined in one unit.
When replacing items separately, C6D and C6E should total 250MMF.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	AIRLINE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	2Meg	½	412A	AB-76	A47-2Meg-Z	Q13-139	U-55	Volume
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R1A
R2	500KΩ	½	411					Tone & switch

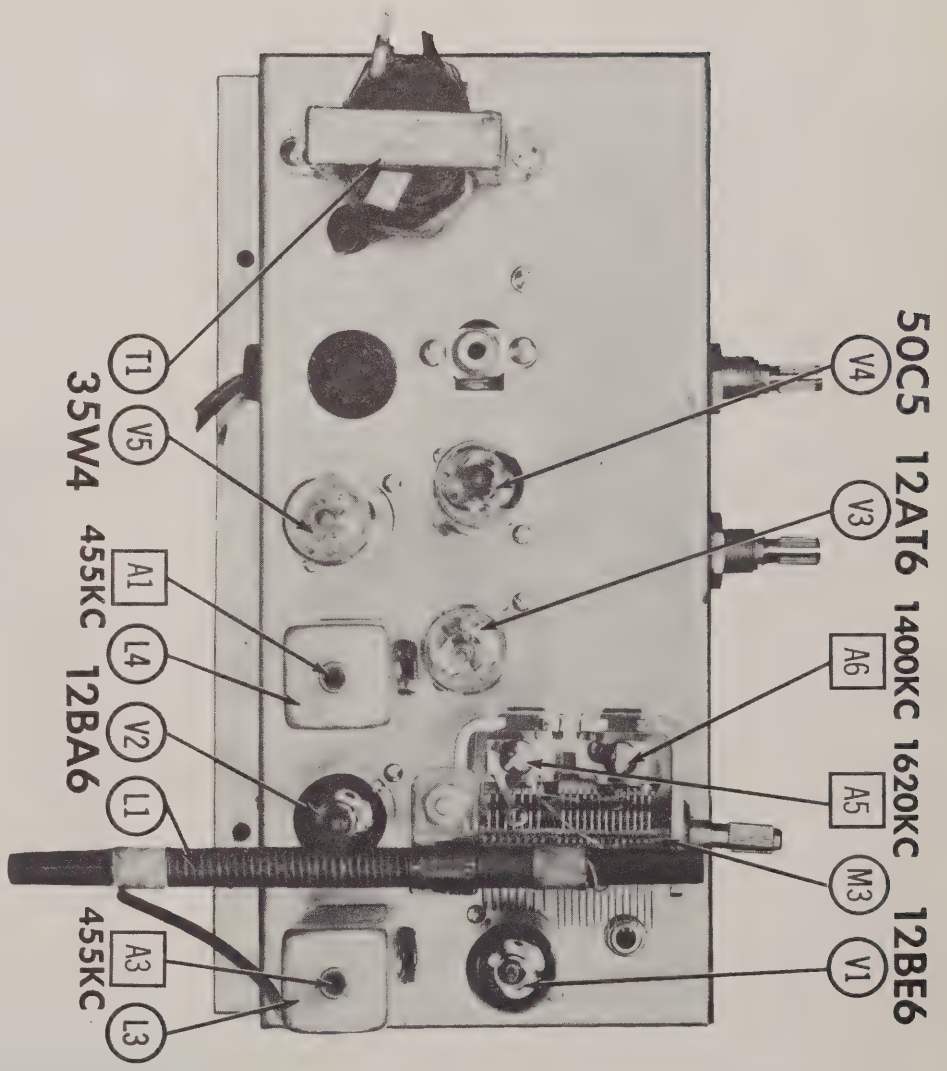
RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	AIRLINE PART No.	IRC PART No.	
R3	22KΩ	½		BTS-22K	
R4	150Ω	1/2		BTS-150	
R5	47KΩ	1/2		BTS-47K	
R6	2.2Meg	1/2		BTS-2.2Meg	
R7	470KΩ	1/2		BTS-470K	
R8	270KΩ	1/2		BTS-270K	
R9	2200Ω	½		BTS-2200	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	AIRLINE PART No.	IRC PART No.	
R10A	6.8Meg		♦827	BTS-6.8Meg	
B	470KΩ			BTS-470K	
C	470KΩ			BTS-470K	
R11	150Ω	½		BTS-150	
R12	470Ω	1		BTA-470	Note 1
R13	1000Ω	1		BTA-1000	
R14	27Ω	2	542		
R15	22KΩ	½		BTS-22K	Note 2

♦ Items R10A, R10B, R10C, C6A, C6B, C6C, C6D, C6E are combined in one unit.
Note 1. Some versions use a 270Ω, 1 watt resistor in this application.
Note 2. Some versions use a 10KΩ, ½ watt resistor in this application.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	AIRLINE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2.4KΩ	3-4Ω	1209C						

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	AIRLINE PART No.	QUAM PART No.	RCA TYPE No.	
SP1	6"	PM	3-4Ω	2627	6A1	229S1	
SP2	3½"	PM	11Ω	2630	3A15T		

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	AIRLINE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	.7Ω		1509				Tapped @ .7Ω
L2	Osc. Coil	7.3Ω		1408				
L3	Input IF	12Ω	13Ω	1405	16-6758	BC-352	12-C1	
L4	Output IF	12Ω	14Ω	1406A				

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	AIRLINE PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1	60-47			46-T	0-1 or S-1 & 0-3	

ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

PHONO NEEDLE

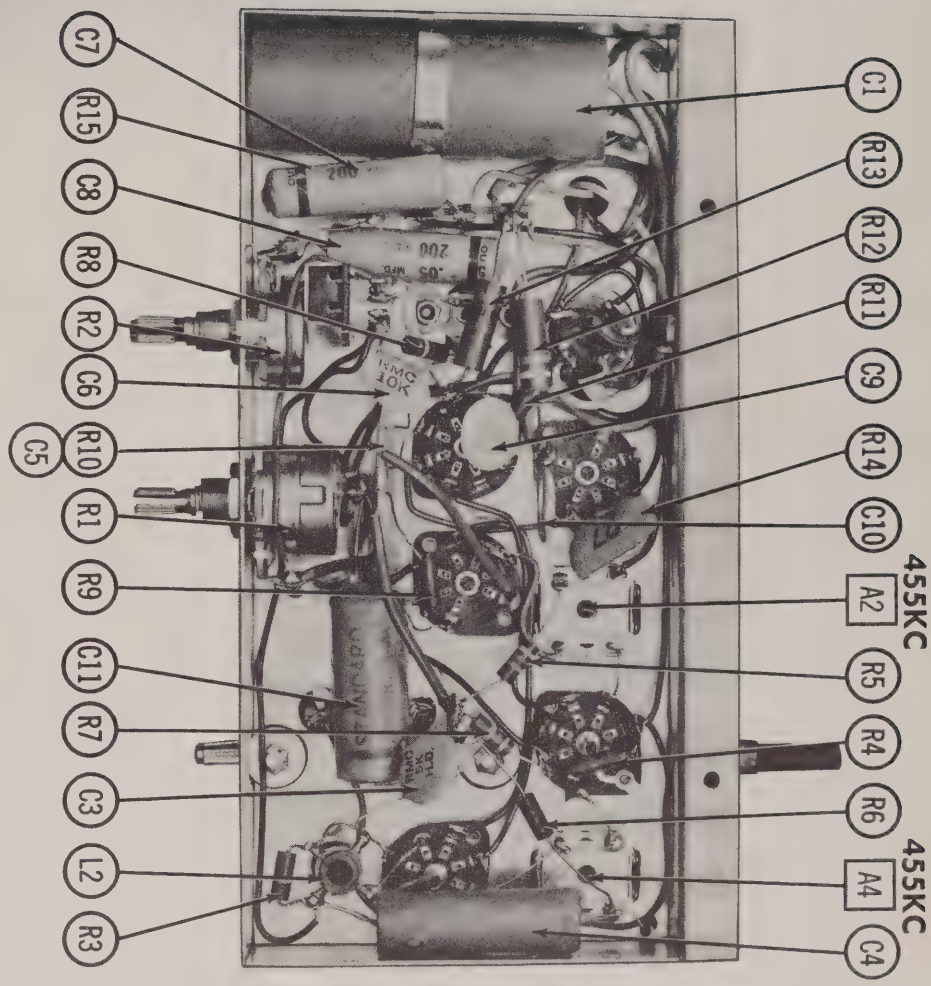
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	AIRLINE PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	
M2	61-48 (78RPM Needle)	†CR-55 or ♦CR-55D	†C-449 or ♦C-449D	†W-64S or ♦W-64D	† Jewel ♦ Diamond
	61-47 (33 1/3-45RPM Needle)	†CR-55LP or ♦CR-55LPD	†A-448 or ♦A-448D	†W-64MGS or ♦W-64MGD	

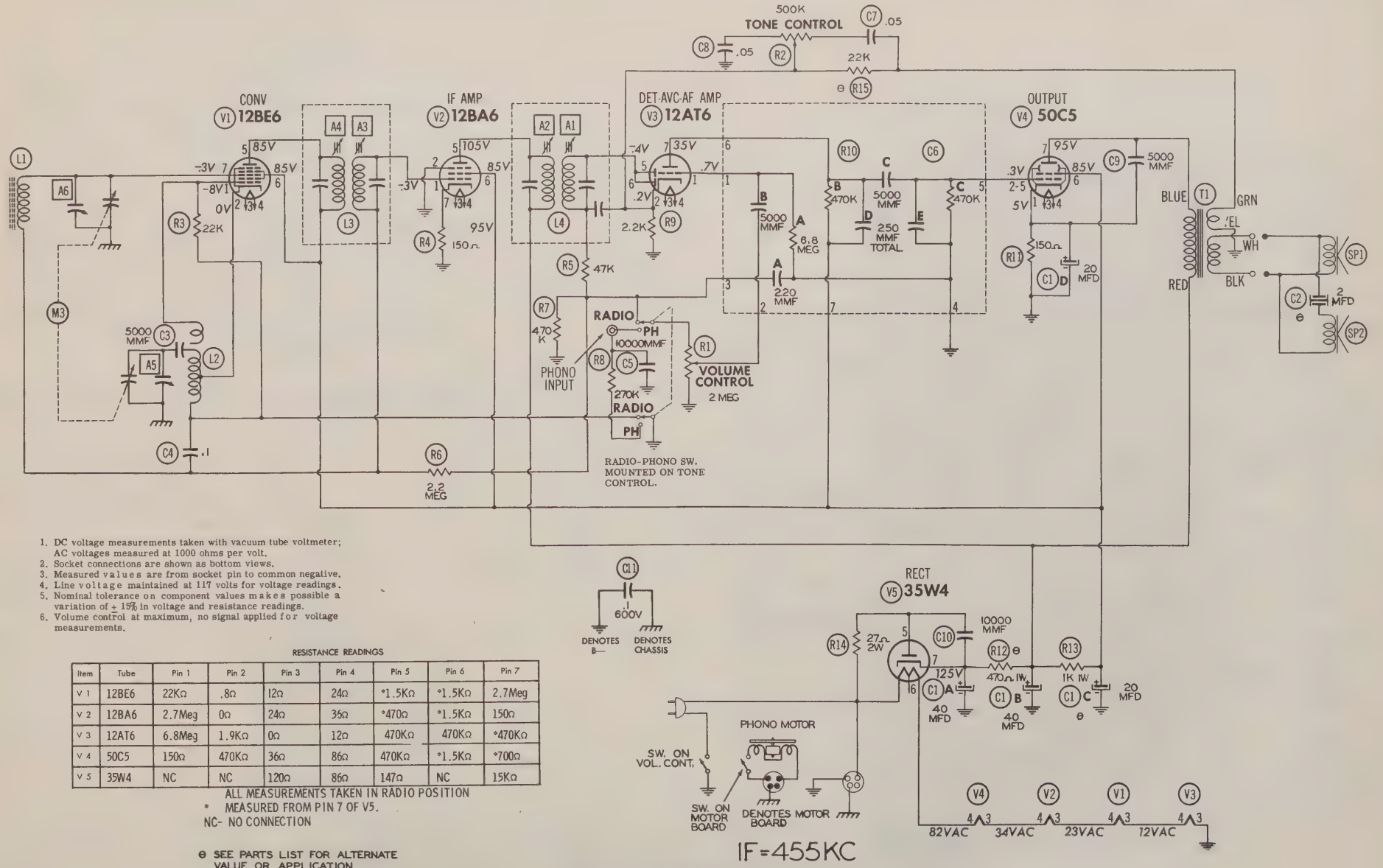
MISCELLANEOUS

ITEM No.	PART NAME	AIRLINE PART No.	NOTES
M3	Tuning Cap.	1017	2 Gang (34-400MMF, 13-105MMF)
	Cabinet	2063	
	Knob	2430B	On-off-volume
	Knob	2430A	Tone, Radio-Phono switch
	Knob	2430	Tuning
	Handle	1772	Cabinet

CHASSIS—BOTTOM VIEW



AIRLINE Model GAA-990A



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.8Ω	12Ω	24Ω	*1.5KΩ	*1.5KΩ	2.7Meg
V 2	12BA6	2.7Meg	0Ω	24Ω	36Ω	*470Ω	*1.5KΩ	150Ω
V 3	12AT6	6.8Meg	1.9KΩ	0Ω	12Ω	470KΩ	470KΩ	*470KΩ
V 4	50C5	150Ω	470KΩ	36Ω	86Ω	470KΩ	*1.5KΩ	*700Ω
V 5	35W4	NC	NC	120Ω	86Ω	147Ω	NC	15KΩ

ALL MEASUREMENTS TAKEN IN RADIO POSITION
* MEASURED FROM PIN 7 OF V5.
NC- NO CONNECTION

θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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BELL & HOWELL
MODELS 300B, M, S

Figure 1

GENERAL INFORMATION

The Bell & Howell Models 300B, 300S, and 300M are mechanically and electrically identical. The major difference is in the cabinet used. Model 300B has a blonde cabinet, Model 300S has a ruggedized wood case, and Model 300M has a mahogany cabinet. The Bell & Howell Models features Stop, Forward, Rewind, Play, and Record modes of operation merely by pressing a button. A Speaker push-button is also provided for monitoring programs or for using the recorder as a P.A. System. This recorder is of the dual-track type, giving two full length recordings on a single reel of recording tape. Any reel size up to 7" can be used. Two neon recording indicators simplify the recording level setting. New recordings can be made on previously recorded tape since the erase head is automatically connected when the "Record" button is pressed or the same recording may be played back indefinitely. Recordings can be made from a radio, television receiver, or phonograph in addition to those made directly from the microphone. Recordings can be played back through the self-contained speakers or an external speaker may be connected through use of the Speaker Jack.

Bell & Howell is designed to operate on 115 volts, 60 cycle, AC supply only.

CAUTION: Severe Damage Will Result If Connection Is Made To A Direct Current (DC) Line.

Manufactured by:

Three Dimension Co.
3512 N. Kostner Ave.
Chicago 41, Illinois

PROPERTY OF
L. F. D. ENTERTAINMENT
3021 MEADE ST.
DENVER, COLORADO

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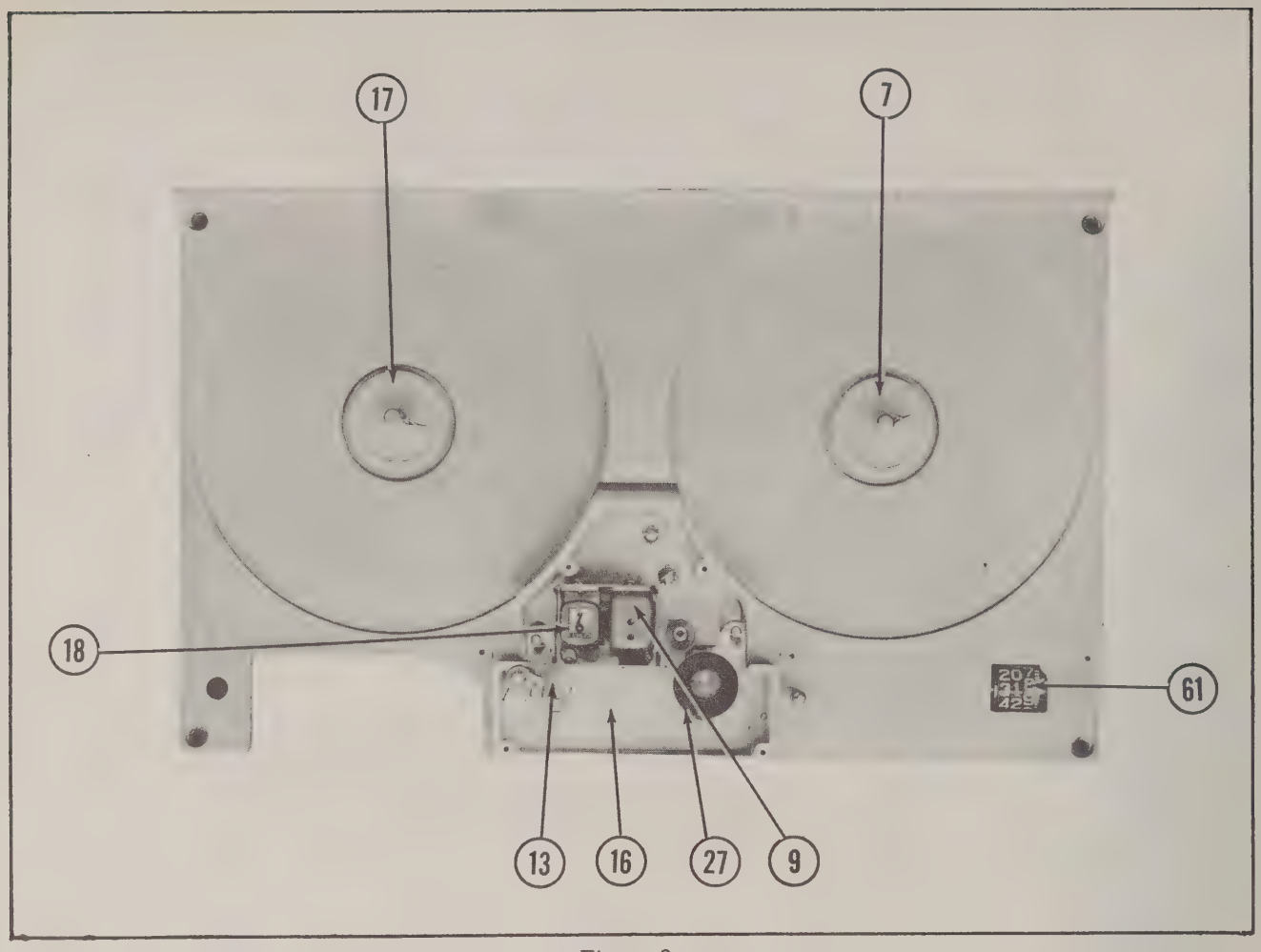


Figure 2

SPECIFICATIONS

Reel Size-

Up to 7".

Tracks-

Dual.

Track Selection-

Manual turnover.

Tape Loading-

Drop-in-slot type.

Tape Speed-Play and Record-

7 1/2 and 3 3/4 ips.

Fast Forward-

7" reel in 90 seconds.

Fast Rewind-

7" reel in 90 seconds.

Speakers-

2 electrostatic "tweeters".
2-8" low-frequency "Woofers".

Recording Time(7" reel)-

1 hour at 7 1/2 ips. (1/2 hour each track)
2 hours at 3 3/4 ips. (1 hour each track)

Overall Frequency Response-

(Record To Playback At 7 1/2 ips.)
±2db from 50 to 10,000 cps.

Distortion-

Less than 3% at 4 watts.

Power Output-

8 watts.

Wow and Flutter-

(At 7 1/2 ips.)
Less than 0.02%.

Audio Inputs-

Microphone, Radio, Phono, TV.

Audio Output-

(a)Internal or Extension Speaker.
(b)External Amplifier.

Controls-

3 knobs, 6 electric pushbuttons.

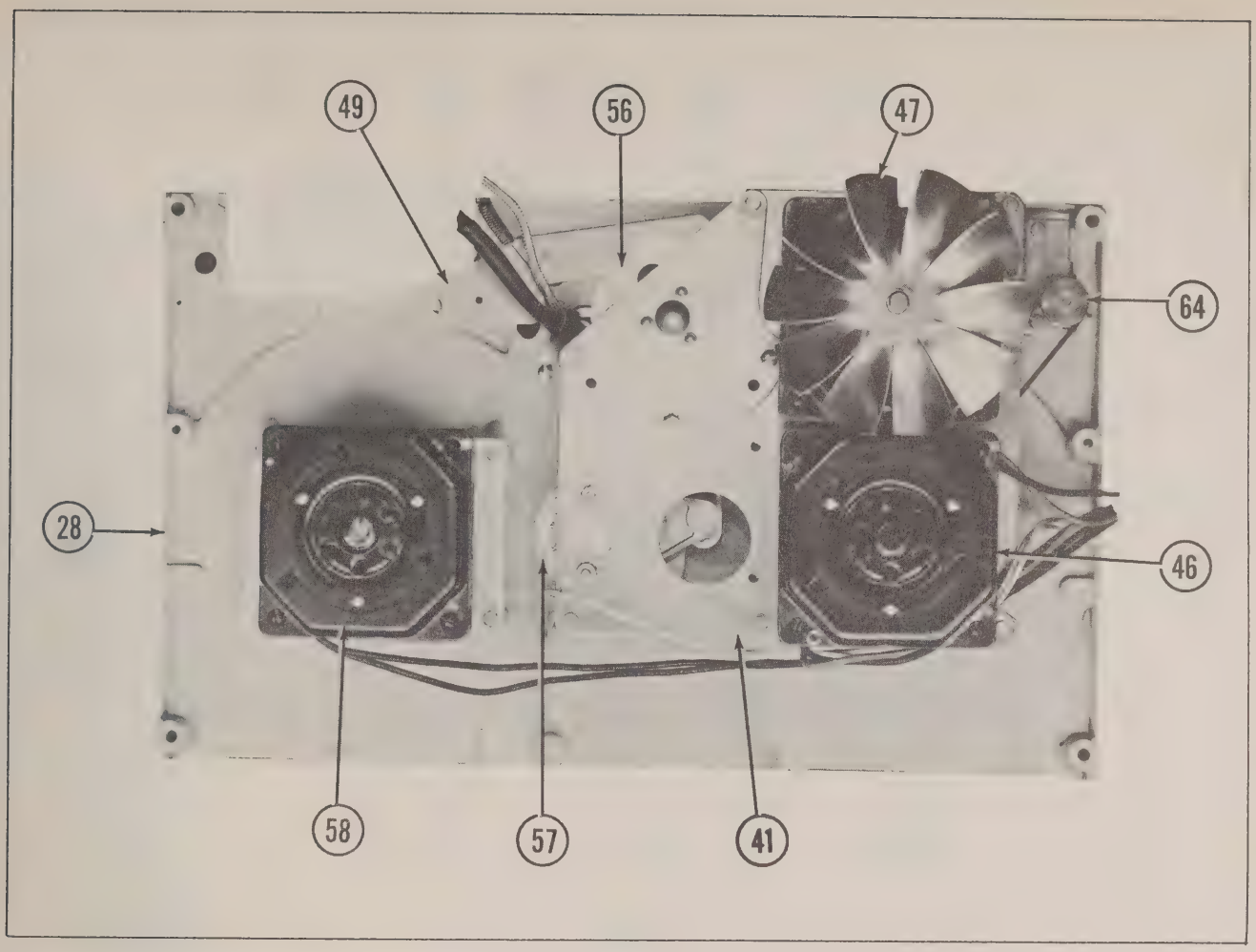


Figure 3

OPERATING INSTRUCTIONS

Making Connections-

Turn the "tone" control to the left to "Off" and plug the power cord into a convenient wall outlet of the proper rating.

Threading The Tape-

With the "Stop" button depressed, place an empty reel on the right hand (take-up) spindle. Place a full reel of tape on the left hand (supply) spindle so that the reel will turn counterclockwise when tape is pulled from the reel. Make certain that the reel springs on the spindles engage one of the slots in the hubs of the reels and that the reels are fully seated. Reel out about two feet of tape and feed the loose end up into the empty reel on the right spindle. Thread the tape into one of the slots in the outer surface of the hub. Hold the loose end between the fingers and slowly rotate this reel counterclockwise through a couple of revolutions. While taking up slack in the tape between the two reels the tape will automatically drop into the tape slot.

To Record From Microphone-

1. Insert the microphone plug into the "Mic. - Radio-Phono" input jack.

2. Turn the "Off-Tone-On" control to the right until a click is heard and allow approximately 30 seconds for the unit to warm up. "Power on" condition is indicated by indirect illumination of the lucite knobs from behind the front panel.

3. Unlock and push the "Record" button. Observe the "Record Level" indicator lamps while speaking into the microphone. Occasional flickering of the "Distortion" lamp indicates a good, high level of recording, however, continuous glowing or flashing in this lamp indicates that the "Volume" control setting must be reduced. Be sure that the "Normal" lamp glows fairly full and steady or you may not be recording properly, if at all.

NOTE: The "Tone" control is inoperative when recording.

Mic.-Radio-Phono Input-

This two-circuit, front-panel input jack provides a 220,000 ohm high-impedance input for the microphone and a low-impedance input for recording from a radio, phonograph or TV set. A two-conductor attachment cord is supplied in the storage compartment. This cord is terminated at one end with a jack plug and at the other with two alligator clips to enable you to make connection to various equipment for recording or monitoring.

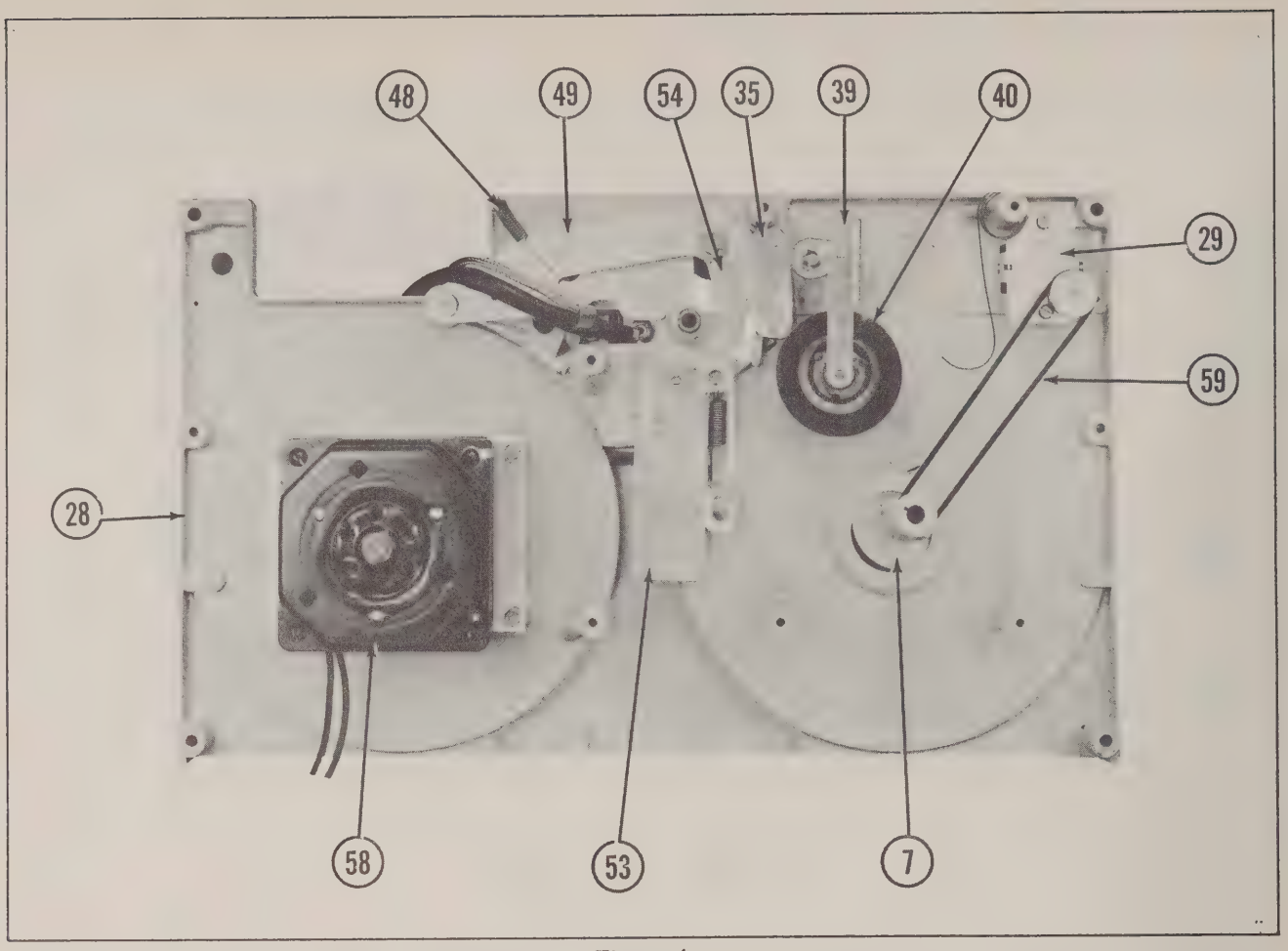


Figure 4

To Record From Radio, TV, Or Phonograph-

1. Take the radio-phono attachment cord from the storage compartment.

2. Turn off power to the recorder.

3. With the two alligator clips on the end of the radio-phono attachment cord, connect across the amplifier output or voice coil on the speaker of the radio, phono, or TV set.

4. Insert the plug of the radio-phono cord into the Mic.-Radio-Phono input jack on the front panel of the recorder .

5. Proceed with the recording as described in "To Record From Microphone".

Double-Track Recording-

The Bell & Howell is designed so that only 1/2 the tape width is recorded at a time, thereby resulting in double-track recording. This double-track operation is accomplished in the following manner:

1. After a reel of tape has been recorded, i.e. all the tape wound on to the take-up reel, depress the "Stop" button. This stops all movement of the tape.

2. Remove the reels from the recorder, turning the full reel over and placing it on the left spindle and the empty reel on the right spindle.

3. Properly thread the tape and proceed with the recording.

4. After the second track has been recorded the first track is ready to be played, without rewinding, as follows:
   (a) Place the full reel of tape on the left spindle and the empty reel on the right spindle.

   (b) Thread the tape making sure the dull side faces the play-record head.

   (c) Set the controls as described under "To Play A Recording".

To Play A Recording-

1. Thread the tape as described under "Threading The Tape".

2. Turn the "Off-Tone-On" control to the right and allow about 30 seconds for warm up.

3. Depress the "Play" button until it is latched into position.

4. Adjust the "Volume" and "Tone" controls for desired level.

To Edit And Splice Tape-

NOTE: Since it is impossible to edit and splice one track without affecting the other, recordings

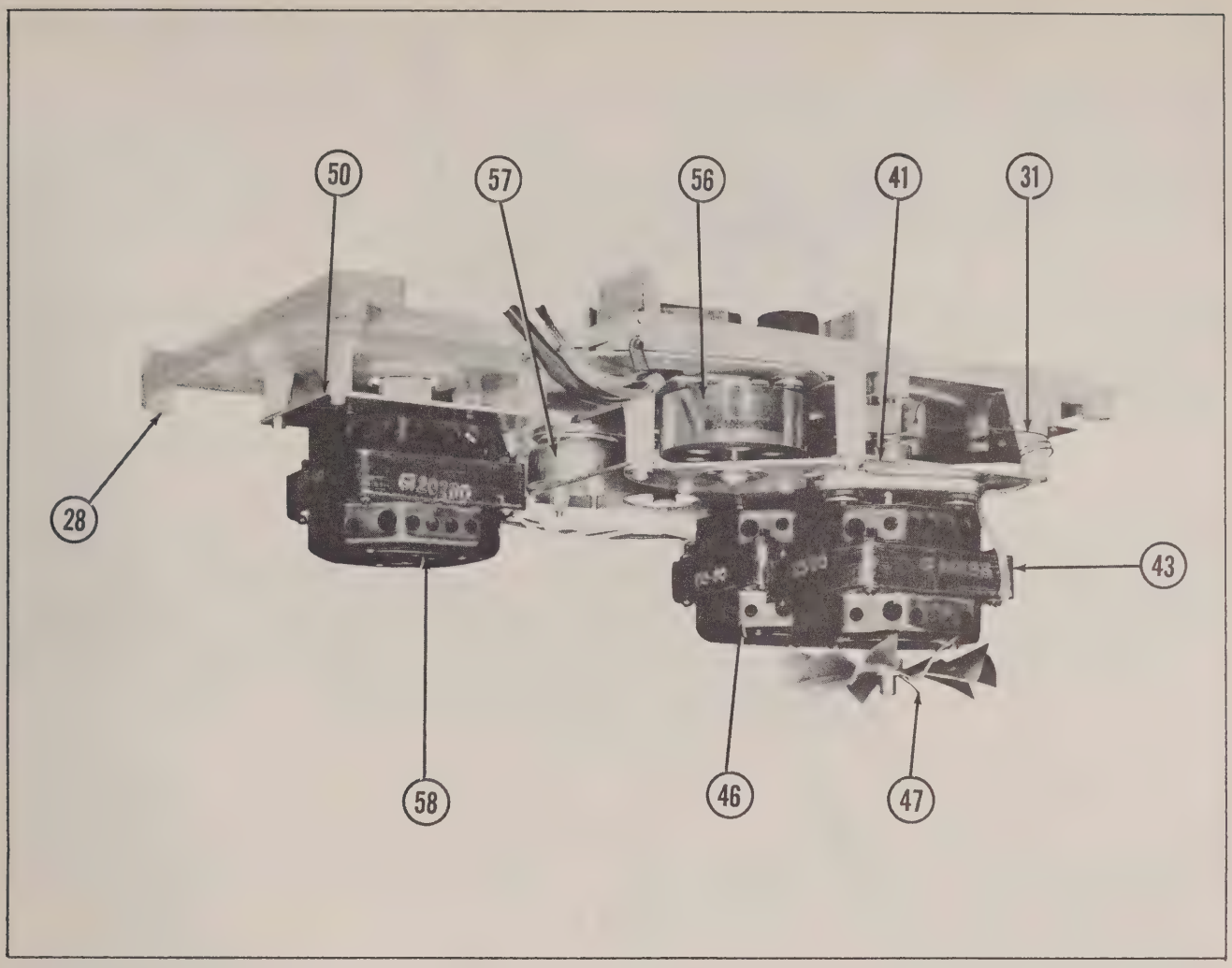


Figure 5

which are to be edited should be limited to one track only.

1. The tape may be edited by cutting out unwanted portions, or by joining selections into another sequence. Announcements may be inserted between selections, etc. Unused sections of tape can be spliced together for re-use.

(a) Cut tape at 60^0 angle with an overlap so ends will line up. (Cutting tape at 60^0 angle will eliminate detection of splice on recording.)

(b) Align both ends of tape, with glossy side up.

(c) Cover aligned ends with splicing tape, evenly and securely.

(d) Trim off excess splicing tape. (Cut into the recording tape very slightly.) This eliminates possibility of a sticky splice.

To Use External Speaker-

Any size speaker of the permanent magnet type, having a 3.2 ohm voice coil, may be used by connecting the alligator clips of the radio-phono cord across the voice coil of the external speaker and then inserting the radio-phono cord plug (same type as speaker plug) into the "Speaker" jack.

Fast Forward And Fast Rewind-

High-speed forward or rewind can be obtained by pressing the desired button. These functions are used primarily in locating a desired portion of a recording in a few seconds. You may press the "Forward" or "Rewind" button while in "Play" or "Record" positions but you cannot switch to other functions until you have first pressed the "Stop" button.

IMPORTANT: When pressing the "Stop" button. . . hold it down until the reels come to a complete stop.

To Use Recorder As A Public Address System-

To operate this recorder as a public address unit, insert the microphone plug into the "Mic.-Radio-Phono" input and turn the power on. At the back of the amplifier move the "Tape Drive" switch (Figure 2) to "Off". Unlock and press the "Record" and "Speaker" buttons. While speaking into the microphone adjust the "Volume" and "Tone" controls to the desired level.

The public address program may be recorded by leaving the "Tape Drive" switch in the "On" position. Then, proceed with the program as described above.

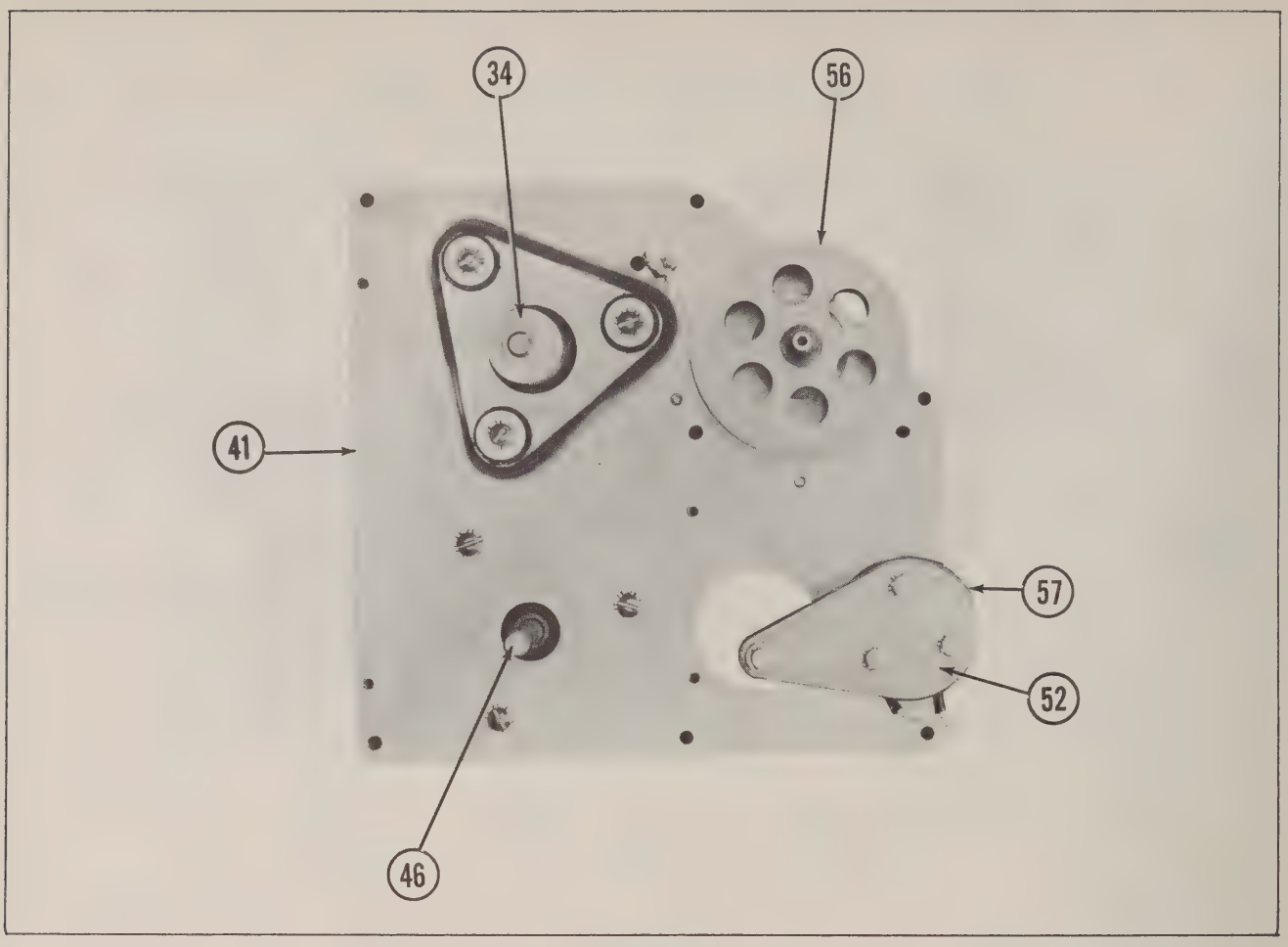


Figure 6

Program Indicator-

This odometer- type indicator registers "000" to "999" and will save much guesswork when trying to locate a desired portion of a pre-recorded tape. The reading of the indicator may be noted as the recording is being made so that reference to any given point on the tape may be made very rapidly. When a recorded tape has been so logged or referenced, always "zero" the indicator before starting to play the recording. This should be done before tape is threaded on the take-up reel. Press the "Forward" button and observe the indicator. Use the "Stop" button when approaching "000" and then the last few digits can be turned off manually by spinning the take-up reel with the fingers.

Speed Change-

This recorder operates at two speeds - 7 1/2 or 3 3/4 inches-per-second. The "Speed Change" knob will enable you to play or record tape at either speed. For 3 3/4" operation, take hold of the knob and turn it gently to the left, pull out, and release. To restore the setting to 7 1/2", take hold of the knob as before, turn it gently to the left, push in, and release.

ADJUSTMENTS

Play/Record Head Adjustment-

It is very important that play-record head (9) be lined up perfectly with the tape. If it is not, low output, loss of high frequencies or track overlap may result.

IMPORTANT: The heads have been aligned and locked in place at time of manufacture and should require no further adjustment, unless it becomes necessary to install a new head.

To adjust, make a tape recording of a 3000 cycle signal on a good unit. Place this on the unit that the head is to be aligned on. Connect an output meter or AC voltmeter across the speaker voice coil. Play the 3000 cycle tape, rock play-record head (9) back and forth, loosening two screws (1) will allow you to do this, and notice a variation in the output voltage at the voice coil. Tighten screws (1) in the position of highest output.

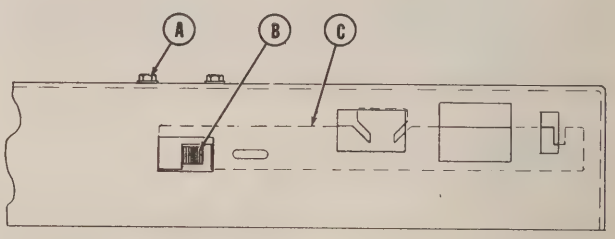


Figure 7

Memory Switch Adjustment-
(To Correct Imbalance In Braking)-

Remove amplifier chassis from case. Just above toggle on front of amplifier are two nuts (A) (See Fig. 7). Loosen these two nuts. Press the "Rewind" button to the bottom. Pull toggle of (B) to extreme right on switch assembly. Position entire switch assembly with left side of toggle just touching the latch bar (C) as shown in Fig. 7, then tighten the two nuts (A).

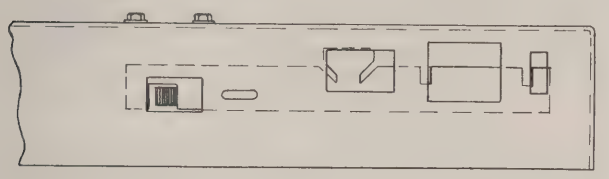


Figure 8

To check the adjustment, press the "Forward" button and observe new position of the toggle. It should then be in the extreme left position with the latch bar just touching the right side of the toggle as shown in Fig. 8.

LUBRICATION

The Bell & Howell has been lubricated at time of manufactured and this should be sufficient for the life of the recorder. In case of extreme use or if parts are replaced, spread a thin film of Lubriplate on the pivot points of levers. Part such as pressure roller (27), idler wheel (40), and flywheel assembly (56) are provided with generous - size oilite bearings and require no further attention.

CAUTION: Do not oil the motor bearings unless absolutely necessary as excess oil will only be thrown off and get on the pulleys and rollers. Always use as little oil as possible. If any oil should get on the pulleys or rollers wipe off with a petroleum solvent, such as alcohol.

CLEANING

The erase head, play/record head, capstan, and pressure roller are subject to an accumulation of tape coating oxide which is worn off the tape as it passes these parts. If left unattended the playing and recording qualities of the recorder will be affected. Periodically clean these surfaces with a soft cloth and alcohol.

TROUBLE CHART

SYMPTOM	CAUSE	REMEDY
Broken reel spring (4).	Defective spring (4).	Replace spring. Turn spindle (7 or 17) until spring is on top of spindle. With long end of #8 allen wrench reach over spindle motor, locate and engage head of allen set screw (6) in top of hub between motor and Mechanical Housing (28). Give allen wrench one-half turn to left to loosen screw and pull out broken spring from the top of Mechanical Housing (28). Insert new spring and tighten set screw. NOTE: When placing new spring in position- push all the way in, then back out about 1/32" before tightening allen set screw.
Tape reel rubs on front panel.	Spindle hub (7-17) out of alignment.	(a)Remove reel spring (4), as above. (b)Turn spindle until reel spring slot is under spindle. With #8 allen wrench reach over spindle motor, locate and engage head of allen set screw in hub between motor and front panel. Give allen wrench one-half turn to left to loosen screw. (c)Slide hub slightly outward on spindle away from front panel and tighten set screw. Put empty reel on spindle and check for clearance between reel and panel and also for alignment of reel hub with tape feed from capstan. (d)Install reel spring (see "Replace Spring" above).
Take-up or Rewind sluggish or inoperable.		IMPORTANT: Tape is an elastic meduim of recording. Stretching this tape will introduce "wow" and "flutter" (distortion) for in excess of the design specifications to which the recorder is manufactured. Fast tape transport in both directions is a highly desirable feature but must not be achieved at the sacrifice of fidelity of the

SYMPTOM	CAUSE	REMEDY
		recorded tape. For this reason the 'take-off" must be a gentle action with positive control of the transport function particularly at the ends of the tape. NOTE: A full 7" reel of 1200 feet of tape can be transported in either direction in about 40 seconds. Due to the gentle take-off action a slight manual assistance may be necessary to start the reels. By this means positive control is maintained and the tape may be repositioned at any point with great accuracy and with no loss of overall fidelity.
Takeup or Rewind sluggish (continued).	1. Low supply voltage.	1. Check line voltage. Should be between 105 and 125 volts AC.
	2. Drive Belt (59) between take-up motor and PROGRAM INDICATOR odometer pulley is too tight.	2. Stretch drive belt (59) slightly.
	3. Defective odometer.	3. Remove drive belt (59) from odometer pulley (64) and turn pulley with fingers through several revolutions. If pulley does not turn freely at any point of revolution replace odometer.
	4. Spindle motor bearing out of Alignment due to rough handling during shipment.	4. Tap end of spindle sharply with wooden or plastic handle of screwdriver.
Tape speed erratic.	1. Capstan drive slipping due to oil or dirt on drive surfaces.	1. Clean drive surface using a small lintless, soft cloth (cheesecloth or equivalent) dipped lightly in carbon tetrachloride, alcohol, or lighter fluid. With drive running, hold cloth against motor drive wheel (34), idler wheel (40), and capstan flywheel (56).
	2. Tape wound around capstan; oil or dirt on pressure roller.	2. Remove two screws in front or recording-head cover plate (5). If tape is wound around capstan peel or cut it off. CAUTION: Be extremely careful not to scratch or mar surface of capstan. Use soft cloth dipped in carbon tetrachloride, alcohol, or lighter fluid to clean surface of capstan and pressure roller. Use pipe-stem cleaner dipped lightly in one of above fluids to wipe off any tape dust from face of brush "redheads". Replace cover plate and screws. NOTE: Do not turn screw in too tightly.
Hum in playback.	1. Congested wiring.	1. Separate wires in back of recorder to make certain none comes against moving parts. Check that all plug-in connections are securely in place. Reverse the power cord plug in wall socket.
	2. Recorded signal lever too low.	2. Press "PLAY"button and set "VOLUME" for preferred listening level. Place "SPEED CHANGE" knob in "NEUTRAL" (between the 3 3/4 and 7 1/2 ips.) Hum should disappear indicating too low an input signal lever was used for recording. Set proper input level when recording. NOTE: It should never be necessary to raise the "VOLUME" control setting above "3" or "4" when recording. If hum persists observe the following:

TROUBLE CHART - Con't.

SYMPTOM	CAUSE	REMEDY
	3. AC hum pickup from power equipment (transformers), fluorescent fixtures, etc.	3. Avoid operating the recorder in the proximity of such devices and/ or provide a good electrical ground for the amplifier chassis.
	4. Hum pickup from associated signal equipment.	4. (a)Switch input connections. (b)Provide a common metallic bond between all associated equipment and ground system securely. (c)If signal output voltage of associated equipment is characteristically low use shielded lead between signal source and recorder input.
	5. Defective vacuum tube.	5. Check and replace faulty tube.
Does not erase properly.	Pressure Pad Worn	Remove recording-head cover plate (5) and examine felt pad on pressure levers. Replace if worn. Peel off old pads and mount new ones (from envelope stapled in Instruction book) using Du Pont clear cement or equivalent.
Does not record properly.	1. Faulty operating procedure.	1. Refer to "Operating Instructions". Also observe "REMEDY" column under "Hum In Playback" of this chart.
	2. Pressure pad worn.	2. Examine for worn pads and replace if necessary (see replacement directions above).
	3. Distorted recording.	3. Try recording with microphone supplied with the recorder. If clean recording can be made with "mike" check for mismatched impedance in hookup of associated equipment.

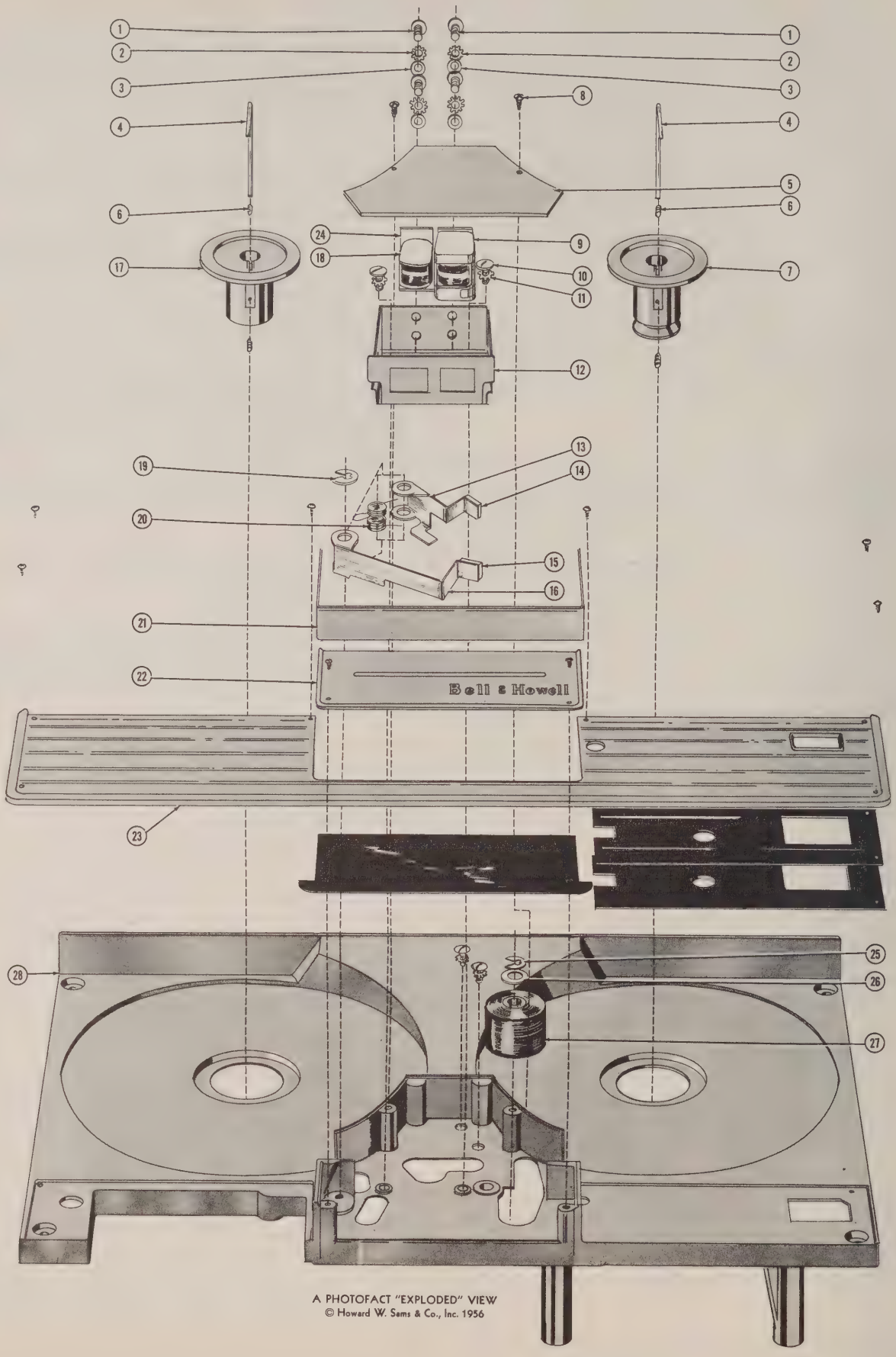


Figure 9A. Exploded View Of Parts Above Baseplate.

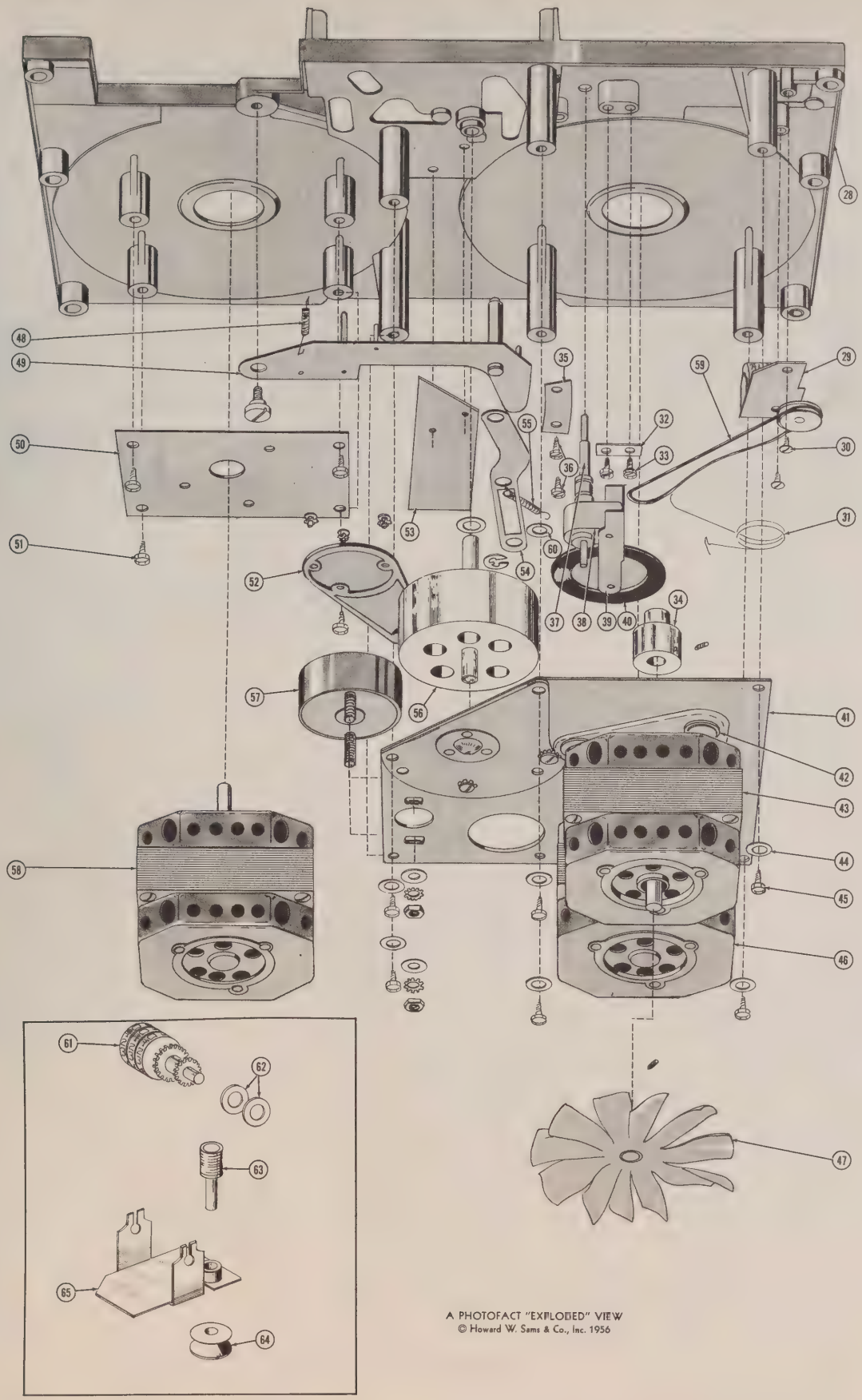


Figure 9B. Exploded View Of Parts Below Baseplate.

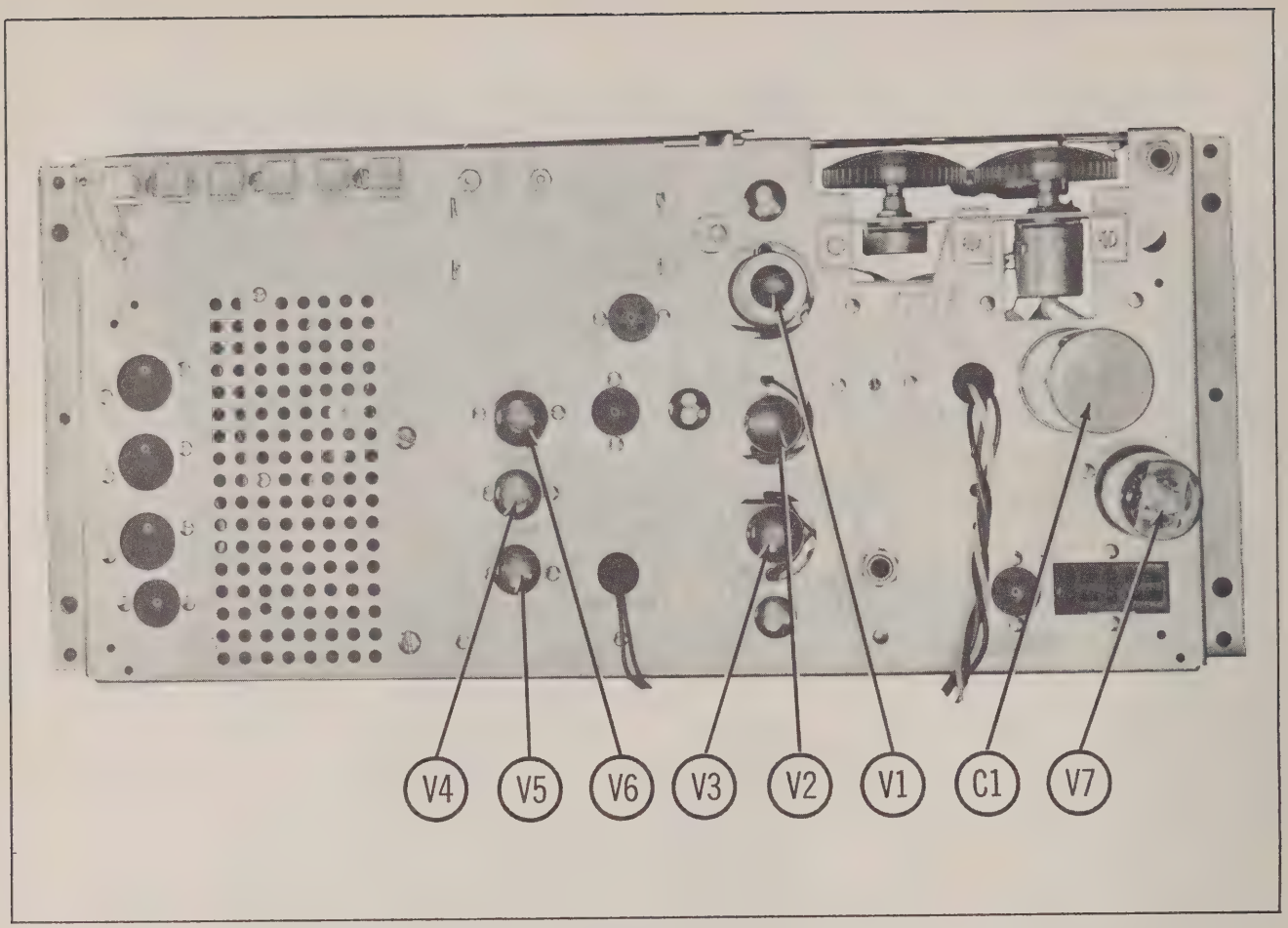
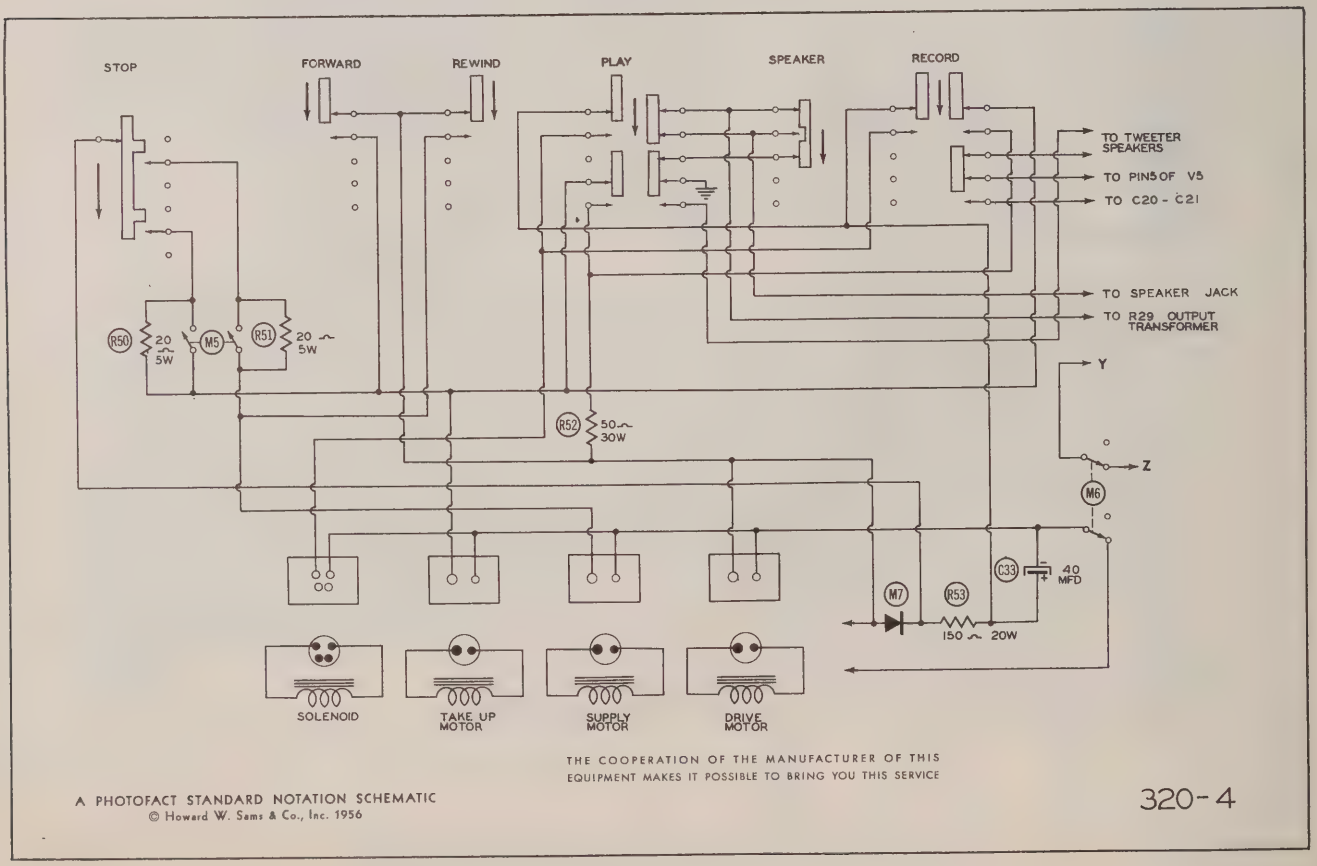
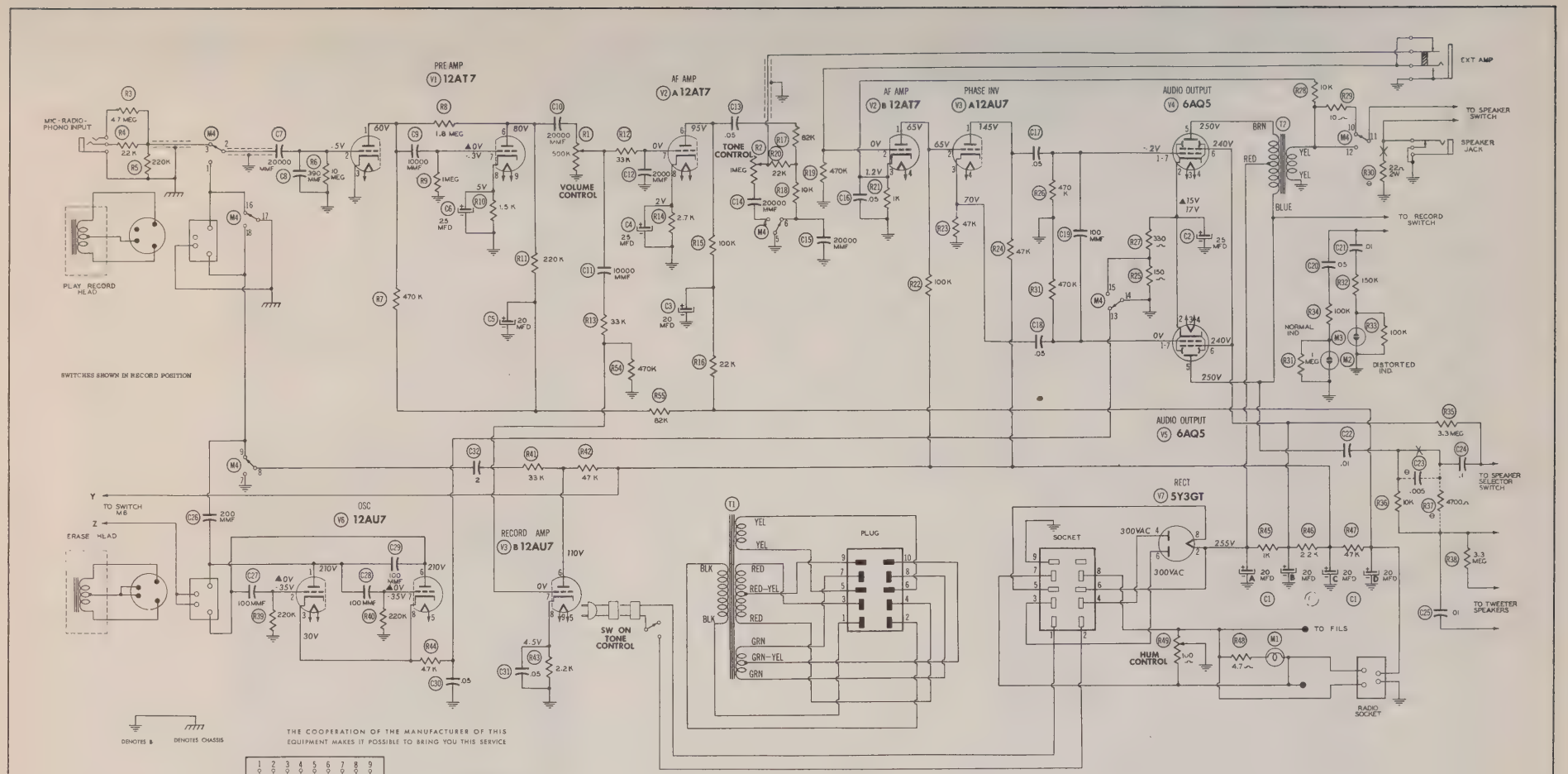


Figure 10



AC WIRING DIAGRAM



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AX7	†800KΩ	10Meg	0Ω	20Ω	30Ω	†300KΩ	1Meg	1.9KΩ	20Ω
V 2	12AT7	†100KΩ	▲470KΩ 40KΩ	1KΩ	20Ω	30Ω	†120KΩ	100KΩ	2.7KΩ	20Ω
V 3	12AU7	†50KΩ	†100KΩ ▲330Ω	47KΩ	20Ω	30Ω	†80KΩ	470KΩ	3.2KΩ	20Ω
V 4	6AQ5	470KΩ	480Ω ▲330Ω	20Ω	20Ω	†200Ω	†1KΩ	470KΩ		
V 5	6AQ5	470KΩ	480Ω	20Ω	20Ω	†200Ω	†1KΩ	470KΩ		
V 6	12AU7	†3.8KΩ	230KΩ	▲INF 4.7KΩ	30Ω	30Ω	†3.8KΩ	220KΩ	▲INF 4.7KΩ	20Ω
V 7	5Y3GT	INF	180KΩ	INF	430Ω	INF	400Ω	INF	180KΩ	

ALL MEASUREMENTS TAKEN IN "RECORD" POSITION UNLESS OTHERWISE DESIGNATED
▲ MEASURED IN "PLAY" POSITION.
† MEASURED FROM PIN 2 OF V7.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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320-4

BELL & HOWELL
MODELS 300B, M, S

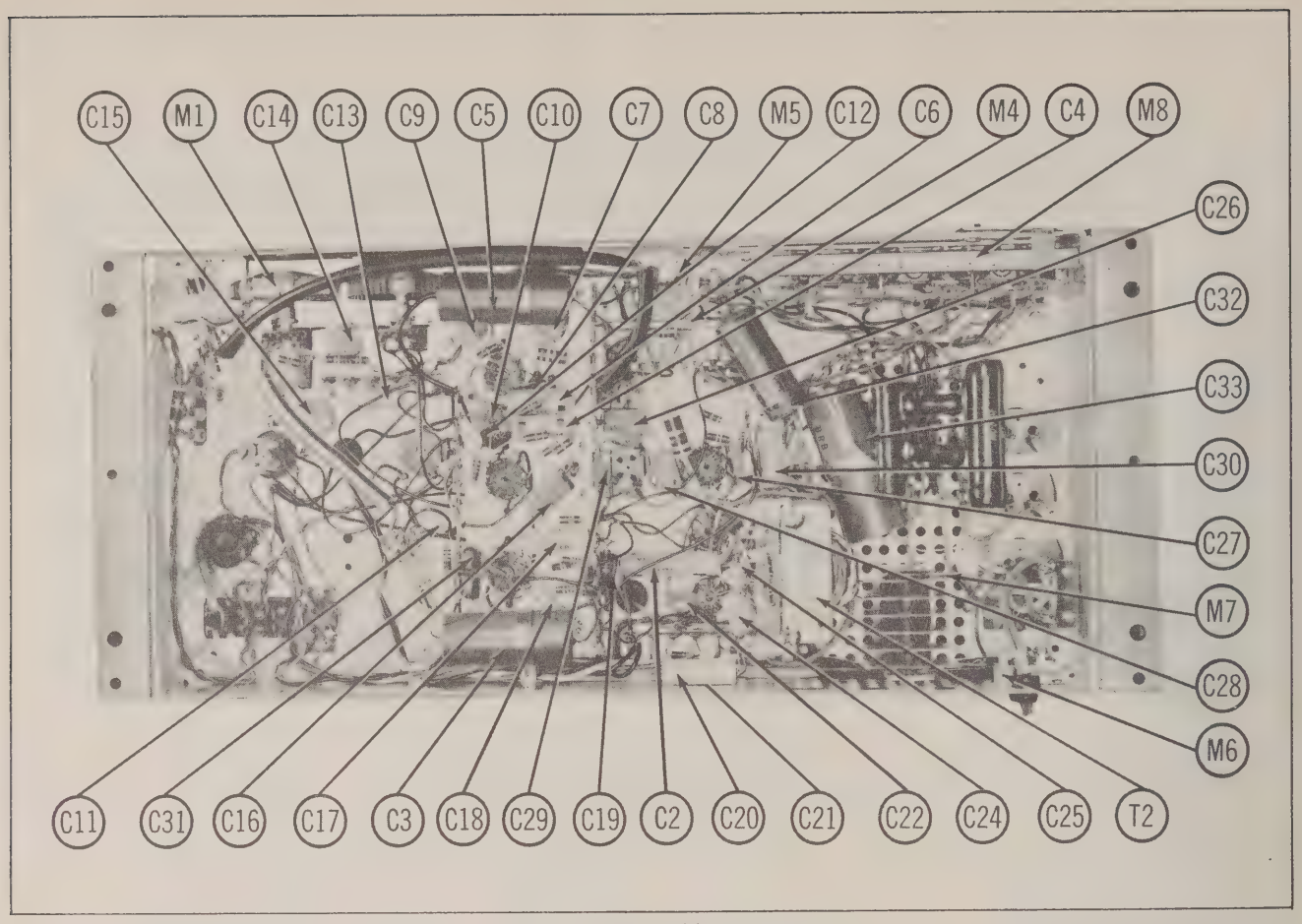

Figure 11

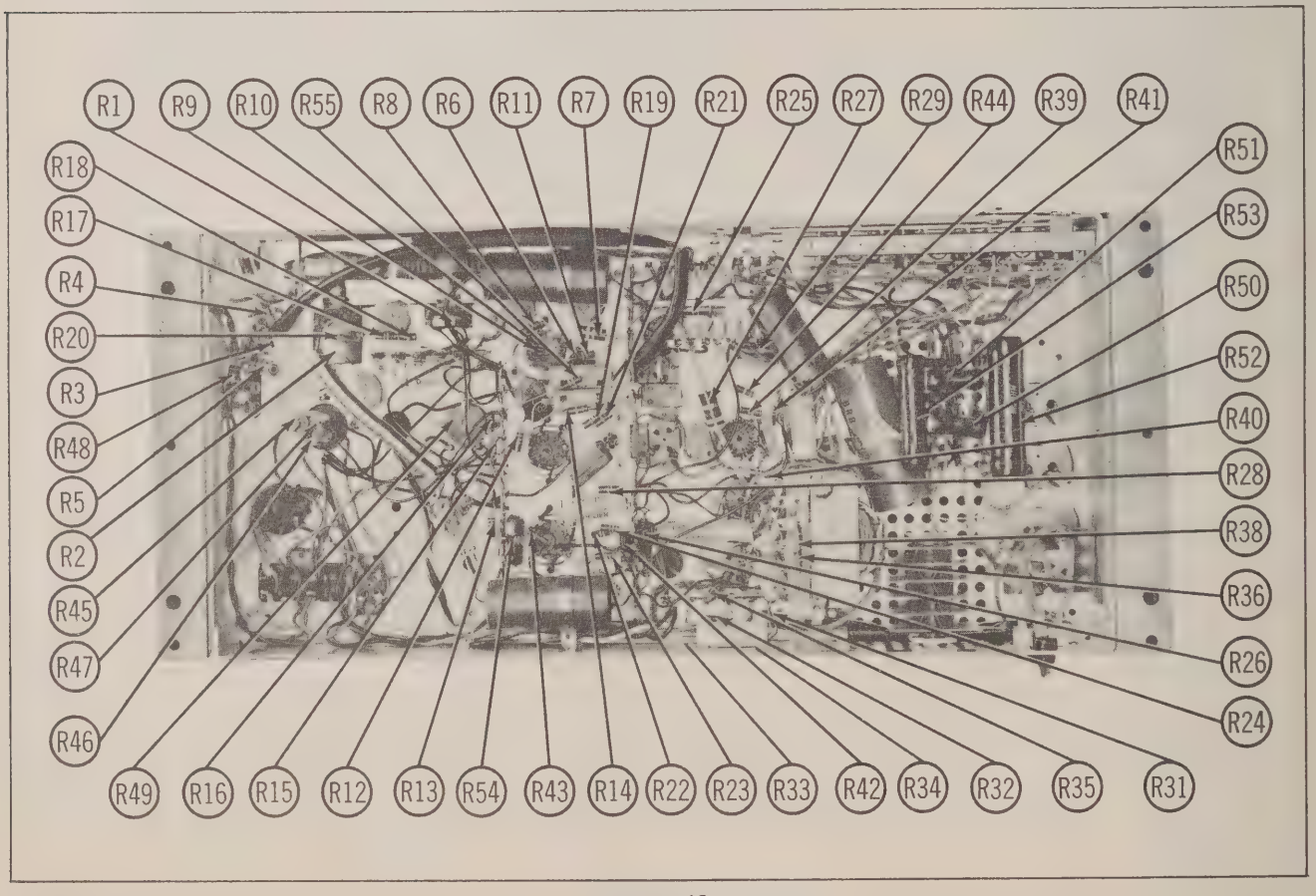

Figure 12

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
V1	93-2	12AT7, Pre-Amp.
V2	93-2	12AT7, AF Amp.
V3	93-3	12AU7, Phase Inv. & Record Amp.
V4	93-4	6AQ5, Output
V5	93-4	6AQ5, Output
V6	93-3	12AU7, Oscillator
V7	93-5	5Y3GT, Rectifier
C1A	98-10	Elect. Cap., 20MFD. @450V.
C1B		Elect. Cap., 20MFD. @450V.
C1C		Elect. Cap., 20MFD. @450V.
C1D		Elect. Cap., 20MFD. @450V.
C2	98-21	Elect. Cap., 25MFD. @50V.
C3	98-26	Elect. Cap., 20MFD. @350V.
C4	98-18	Elect. Cap., 25MFD. @6V.
C5	98-19	Elect, Cap., 20MFD. @350V.
C6	98-18	Elect. Cap., 25MFD. @6V.
C7	98-30	Cap. Ceramic, 20, 000MMF. @10%
C8	98-17	Cap. Ceramic, 390MMF. @500V.
C9	98-15	Cap. Ceramic, 10, 000MMF. @500V.
C10	98-7	Cap. Ceramic, 20, 000MMF. @10%
C-11	98-15	Cap. Ceramic, 10, 000MMF. @10%
C-12	98-6	Cap. Ceramic, 2, 000MMF. @10%
C-13	98-8	Cap. Molded, .05MFD. @400V.
C-14	98-7	Cap. Ceramic, 20, 000MMF. @10%
C-15	98-7	Cap. Ceramic, 20, 000MMF. @10%
C-16	98-20	Cap. Paper Tub., .05MFD. @150V.
C-17	98-8	Cap. Molded, .05MFD. @400V.
C-18	98-8	Cap. Molded, .05MFD. @400V.
C-19	98-12	Cap. Mica, 100MMF. @10%
C-20	98-8	Cap. Molded Paper, .05MFD @400V.
C-21	98-22	Cap. Molded Paper, .01MFD @400V.
C-22	98-15	Cap. Ceramic, 10, 000MMF. @500V.
C-23	98-29	Cap. Ceramic, 5, 000MMF. @10%(Not used in all Models)
C-24	98-28	Cap. Molded Paper, .1MFD. @150V.
C-25	98-15	Cap. Ceramic, 10, 000MMF. @500V.
C-26	98-24	Cap. Mica, 200MMF. @10%
C-27	98-12	Cap. Mica, 100MMF. @10%
C-28	98-12	Cap. Mica, 100MMF. @10%
C-29	98-12	Cap. Mica, 100MMF. @10%
C30	98-8	Cap. Molded Paper, .05MFD. @400V.
C31	98-20	Cap. Molded Paper, .05MFD. @150V.
C32	98-23	Cap. Paper Tub., .2MFD. @600V.
C33	98-14	Elect. Cap., 40MFD. @350V.
R1	99-35	Vol. Control, 500KΩ
R2	99-64	Tone Control, & Sw., 250KΩ
R3	99-3	Resistor, 4.7Meg. @1/2 W.
R4	99-2	Resistor, 22KΩ@1/2 W.
R5	99-1	Resistor, 220KΩ@1/2 W.
R6	99-6	Resistor, 10Meg. @1/2 W.
R7	99-7	Resistor, 470KΩ@1 W.
R8	99-60	Resistor, 1.8Meg. @1/2 W.
R9	99-10	Resistor, 1Meg. @1/2 W.
R10	99-39	Resistor, 1.5KΩ@1/2 W.
R11	99-1	Resistor, 220KΩ@1/2 W.
R12	99-22	Resistor, 33KΩ@1/2 W.
R13	99-22	Resistor, 33KΩ@1/2 W.
R14	99-9	Resistor, 2.7KΩ@1/2 W.
R15	99-8	Resistor, 100KΩ@1/2 W.
R16	99-2	Resistor, 22KΩ@1/2 W.
R17	99-11	Resistor, 82KΩ@1/2 W.
R18	99-14	Resistor, 10KΩ@1/2 W.
R19	99-17	Resistor, 470KΩ@1/2 W.
R20	99-2	Resistor, 22KΩ@1/2 W.
R21	99-44	Resistor, 1KΩ@1/2 W.
R22	99-8	Resistor, 100K@1/2 W.
R23	99-55	Resistor, 47Ω@1/2 W.
R24	99-55	Resistor, 47KΩ@1/2 W.
R25	99-19	Resistor, 150Ω@1 W.
R26	99-7	Resistor, 470KΩ@1/2 W.
R27	99-40	Resistor, 330Ω@2 W.
R28	99-14	Resistor, 10KΩ@1/2 W.
R29	99-21	Resistor, 10Ω@2W.
R30	99-62	Resistor, 22Ω@2W. (Not used in all models)
R31	99-10	Resistor, 1Meg. @1/2 W.
R32	99-16	Resistor, 150KΩ@1/2 W.
R33	99-8	Resistor, 100KΩ@1/2 W.
R34	99-8	Resistor, 100KΩ@1/2 W.
R35	99-65	Resistor, 3.3Meg. @1/2 W.
R36	99-14	Resistor, 10KΩ@1/2 W.
R37	99-41	Resistor, 4.7KΩ@1/2 W.(Not used in all models)
R38	99-65	Resistor, 3.3Meg. @1/2 W.
R39	99-1	Resistor, 220KΩ@1/2 W.
R40	99-1	Resistor, 220KΩ@1/2 W.
R41	99-22	Resistor, 33KΩ@1/2 W.
R42	99-20	Resistor, 47KΩ@1/2 W.
R43	99-56	Resistor, 2.2KΩ@1/2 W.
R44	99-41	Resistor, 4.7KΩ@1/2 W.
R45	99-43	Resistor, 1KΩ@2 W.
R46	99-42	Resistor, 2.2KΩ@2 W.
R47	99-33	Resistor, 4.7KΩ@1 W.
R48	99-29	Resistor, 4.7Ω@1 W.
R49	99-15	Hum Balance Cont., 100Ω
R50	99-37	Resistor, 20Ω@5 W., W.W.
R51	99-37	Resistor, 20Ω@5 W., W.W.
R52	99-57	Resistor, 50Ω@30W., W.W.
R53	99-5	Resistor, 150Ω@20W., W.W.
R54	99-7	Resistor, 470KΩ@1/2 W.
R55	99-11	Resistor, 82KΩ@1/2 W.
T1	130-3	Power Transformer
T2	130-4	Output Transformer
M1	91-17	Pilot Lamp, TS47
M2	87-61	Neon Lamp, NE51, Normal Ind.
M3	87-61	Neon Lamp, NE51, Distorted Ind.
M4	86-18	Play-Record Slide Switch
M5	86-19	Memory Switch Assy.
M6	86-20	Tape Drive Switch
M7	130-6	Selenium Rectifier
M8	86-22	Push Button Switch Assy.

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	3-2	Screw-Bd. Hd. #5-40 x 3/16
2	63-1	Washer-#5 Ext. Tooth
3	61-34	Washer- 9/64 x 1/4 x .031
4	188-10	Spring-Reel
5	188-24	Panel-Record Head Cover
6	41-2	Screw-Set #8-32 x 1/4
7	188-47	Disc-Takeup Spindle
8	11-13	Screw Rd. Hd. Thd. Cut#2-56 x 3/16
9	188-37	Record-Play Head
10	3-4	Screw-Bd. Hd. #6-32 x 1/4
11	63-4	Washer-#6 Ext. Tooth
12	130-202	Tape Guide
13	130-246	Erase Arm
14	130-330	Erase Head Pad
15	130-273	Record Head Pad

Ref. No.	Part No.	Description
16	130-247	Record and Play Arm
17	188-46	Disc-Rewind Spindle
18	188-38	Erase Head
19	82-7	E-Ring
20	130-209	Spring-Double Torsion
21		Nameplate Support
22	355-2	Nameplate- Logo
23	188-6	Escutheon Cabinet
24	130-282	Head Bracket
25	82-7	E-Ring
26	130-207	Washer-Pressure Roller
27	130-264	Roller-Pressure
28	130-M-235	Mech Housing
29	130-S-11	Counter Assembly
30	13-1	Screw-Bd. Hd. Self. Tap. #6-32 x 1/4
31	188-15	Spring-Idler
32	130-206	Speed Changer Shaft Stop
33	18-22	Screw-Hex Hd. Self T. #6-32 x 5/16
34	130-231	Drive Motor Pulley
35	130-296	Roller Plate Guide
36	18-22	Screw-Hex Hd. Self T. #6-32 x 5/16
37	130-212	Speed Changer Shaft
38	130-278	Idler Crank
39	130-211	Idler Link
40	130-263	Idler Wheel
41	130-210	Motor Mounting Plate
42	89-10	Shock Mount (Lord)
43	90-27	Drive Motor
44	61-39	Washer-3/16 x 7/16 x .032
45	18-25	Screw-Hex. Hd. Self T. #8-32 x 1/2
46	90-29	Take Up Motor
47	188-58	Fan-4"(5/16 ID hub)Ventilating
48	188-52	Roller Plate Spring
49	130-201	Pressure Roller Plate
50	130-285	Rewind Motor Mounting Plate
51	18-23	Screw-Hex Hd.Self Tap. #8-32 x 5/16
52	130-S-46	Solenoid Arm & Pin Assembly
53	130-323	Hum Shield
54	130-240	Solenoid Link
55	188-63	Solenoid Link Spring
56	13-S-14	Flywheel Assembly
57	130-254	Solenoid
58	90-38	Rewind Motor
59	130-265	Counter Belt
60	61-9	Washer-Plain. 265 x 1/2 x .030
61	130-S-11	Counter Assembly
62	67-9	Spring Washer (3/16 x 3/8 x .006)
63	130-S-10	Counter Worm Assembly
64	130-252	Counter Pulley
65	130-S-43	Counter Frame & Bearing Assy.

CAPEHART MODELS 52PH56B, M (Ch. CA-241), 53PH56B, F, M (Ch. CA-251)

CAPEHART MODELS 52PH56B, M (Ch. CA-241), 53PH56B, F, M (Ch. CA-251)

CAPEHART MODELS 52PH56B, M (Ch. CA-241), 53PH56B, F, M (Ch. CA-251)

TRADE NAME	Capehart Models 52PH56B, 52PH56M (Ch. CA-241), 53PH56B, 53PH56F, 53PH56M (Ch. CA-251)
MANUFACTURER	Capehart-Farnsworth Corp., Fort Wayne, Indiana
TYPE SET	AC Operated Phono Amplifier With Automatic Record Changer
TUBES (Five)	Types 12AX7 Preamplifier, 12AX7 AF Amplifier-Phase Inverter, (2) 6V6GT Output, 5Y3GT Rectifier
POWER SUPPLY	110-120 Volts AC - 60 Cycles RATING .53 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON THE 3 SPEED RECORD CHANGER USED IN THE 52PH SERIES - SEE SIMILAR V-M MODEL 954B - PHOTOFACT SET #302 - FOLDER #12.
FOR SERVICE INFORMATION ON THE 4 SPEED RECORD CHANGER USED IN THE 53PH SERIES - SEE SIMILAR V-M MODEL 1200 - PHOTOFACT SET #290 - FOLDER #11.

L. F. [illegible]
39[illegible] MAPLE ST.
DENVER, COLORADO

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA		NOTES
		CAPEHART PART No.	STANDARD REPLACEMENT	
V1	Preamplifier	12AX7	12AX7	
V2	AF Amplifier -			
	Phase Inverter	12AX7	12AX7	
V3	Output	6V6GT	6V6GT	
V4	Output	6V6GT	6V6GT	
V5	Rectifier	5Y3GT	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	CAPEHART PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲30	450	750090B-43	AFH4-15-10	D010	FP444.5	TMQ14	Q-050	TVL-4766
B	■20	450							
C	▲20	450							
D	10	450							
C2A	20	450	750381A-7		BR2045	TC75	TD-20-450	FM-4520	TVA-1709
B	25	25			BR252	TC26	TD-25-25	FM-0225	TVA-1205

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

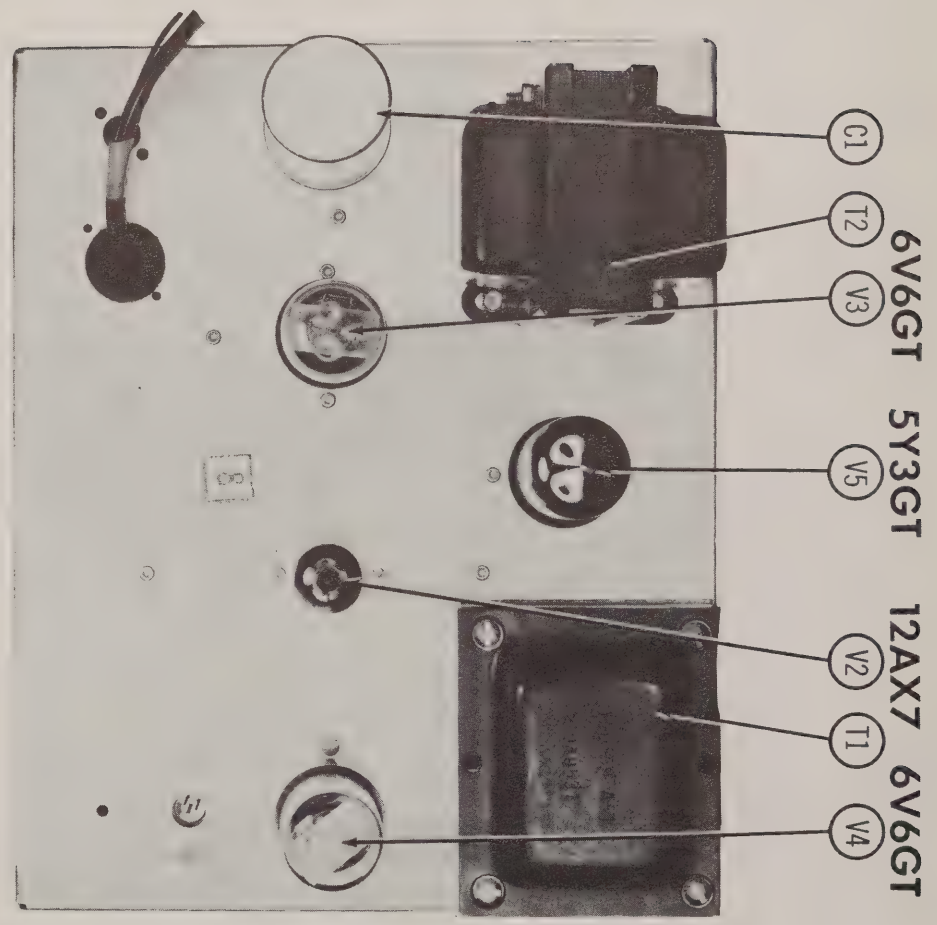
ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	CAPEHART PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	.01	600	2248-1030	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C4	.022	200	2246-2230	BPD-02	DD-203	CUB4S22	817-02	PT4122	4TM-S22	
C5	.1	600	2248-1040	P688N-1	DF-104	CUB6P1		PT601	6TM-P1	
C6	5000		450469A-12	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C7	1500		450469A-23	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C8	1500		450469A-23	BPD-0015	DD-152	K071	801-0015	DC-5215	5HK-D15	
C9	470		450469A-11	BPD-00047	DD-471	K060	831-471	UC-5347	5GA-T47	
C10	470		450469A-11	BPD-00047	DD-471	K060	831-471	UC-5347	5GA-T47	
C11	150		2271-0235	NPO-DI-150	TCZ-150	TZ34	NPO-334-151	ZT-5315	5TCC-T15	
C12	150		2271-0235	NPO-DI-150	TCZ-150	TZ34	NPO-334-151	ZT-5315	5TCC-T15	
C13	47		2271-0223	NPO-DI-47	TCZ-47	Z033	NPO-338-470	ZT-5447	5TCC-Q47	
C14	250		450469A-9	BPD-00025	DD-251	G053	811-251	UC-5325	5GA-T25	
C15	.01	600	2248-1030	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C16	330	500	650162A-9	SI330	D6-331	5W5T33	GP2K-331	UC-5333	1FM-333	
C17	.047	600	2248-4730	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C18	.047	600	2248-4730	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C19	.047	600	2248-4730	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C20	.01	600	2248-1030	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C21	.01	600	2248-1030	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C22	4.0	50	650663A-3							
C23	5000	1500	453521A-1	HVD-15-4700		V2D47				

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	CAPEHART PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	3.2Meg	½	750266A-18	B-85	A47-3Meg-Z	Q13-140	U-57	Volume - See Note #1.
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A.
R2	1Meg	½	454120A-1					High Treble - Tap At 500KΩ.
R3	1Meg	½	454120A-1					Medium Treble - Tap At 500KΩ.
R4	1Meg	½	454120A-1					Low Treble - Tap At 500KΩ.
R5	1Meg	½	454120A-1					High Bass - Tap At 500KΩ.
R6	1Meg	½	454120A-1					Low Bass - Tap At 500KΩ.
R7A	100Ω	2	650642A-11		A43-100		C10P	Hum Adj. (Wire Wound).
B	Shaft		Not Req.		FKS-1/4		Not Req.	Attach to R7A.

Note 1. Later versions will use an alternate control Part No. 750266A-20. 53PH series may use an alternate control Part No. 750266A-21.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CAPEHART PART No.	IRC PART No.	
R8	2.2Meg	½		BTS-2.2Meg	
R9	100KΩ	½	3229-104	BTS-100K	
R10	3900Ω5%	½	650262A-9	BTS-3900 5%	
R11	2.2Meg	½		BTS-2.2Meg	
R12	2700Ω5%	½	3228-272	BTS-2700 5%	
R13	2200Ω	½	3229-222	BTS-2200	
R14	15KΩ	½	3229-153	BTS-15K	
R15	470KΩ	½	3229-474	BTS-470K	
R16	470KΩ	½	3229-474	BTS-470K	
R17	470KΩ	½	3229-474	BTS-470K	
R18	470KΩ	½	3229-474	BTS-470K	
R19	470KΩ	½	3229-474	BTS-470K	
R20	47K	½	3230-473	BTS-47K	
R21	2700Ω5%	½	3228-272	BTS-2700 5%	
R22	100KΩ	½	3229-104	BTS-100K	
R23	470KΩ	½	3229-474	BTS-470K	

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CAPEHART PART No.	IRC PART No.	
R24	220KΩ	½	3229-224	BTS-220K	
R25	3900Ω5%	½	3228-392	BTS-3900 5%	
R26	470KΩ	½	3229-474	BTS-470K	
R27	470KΩ5%	½	3228-474	BTS-470K 5%	
R28	470KΩ5%	½	3229-474	BTS-470K 5%	
R29	220KΩ	½	3229-224	BTS-220K	
R30	3900Ω5%	½	3228-392	BTS-3900 5%	
R31	470KΩ	½	3229-474	BTS-470K	
R32	470KΩ	½	3229-474	BTS-470K	
R33	270Ω 5%	2		BTB-270 5%	
R34	3900Ω	1		BTA-3900	
R35	3900Ω	1		BTA-3900	
R36	3900Ω5%	½	3228-392	BTS-3900 5%	
R37A	1000Ω	5	750288A-8	PW7-1000	
B	400Ω	5		1 3/4A-400	
R38	2200Ω	½	3229-222	BTS-2200	

Note #1. Used in Chassis CA-251 only.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	CAPEHART PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .53A	600VCT @ .070A	5VAC @2A	6.3VAC @ .38A SEC. 4 6.3VAC @1.2A	750559A-1					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	CAPEHART PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	6.8KΩ	6-8Ω	750503B-2	Z1405①	A-3128①	A-3307①	22S68①	S-24A①	① Use 8Ω secondary winding and tape unused windings.

SPEAKER

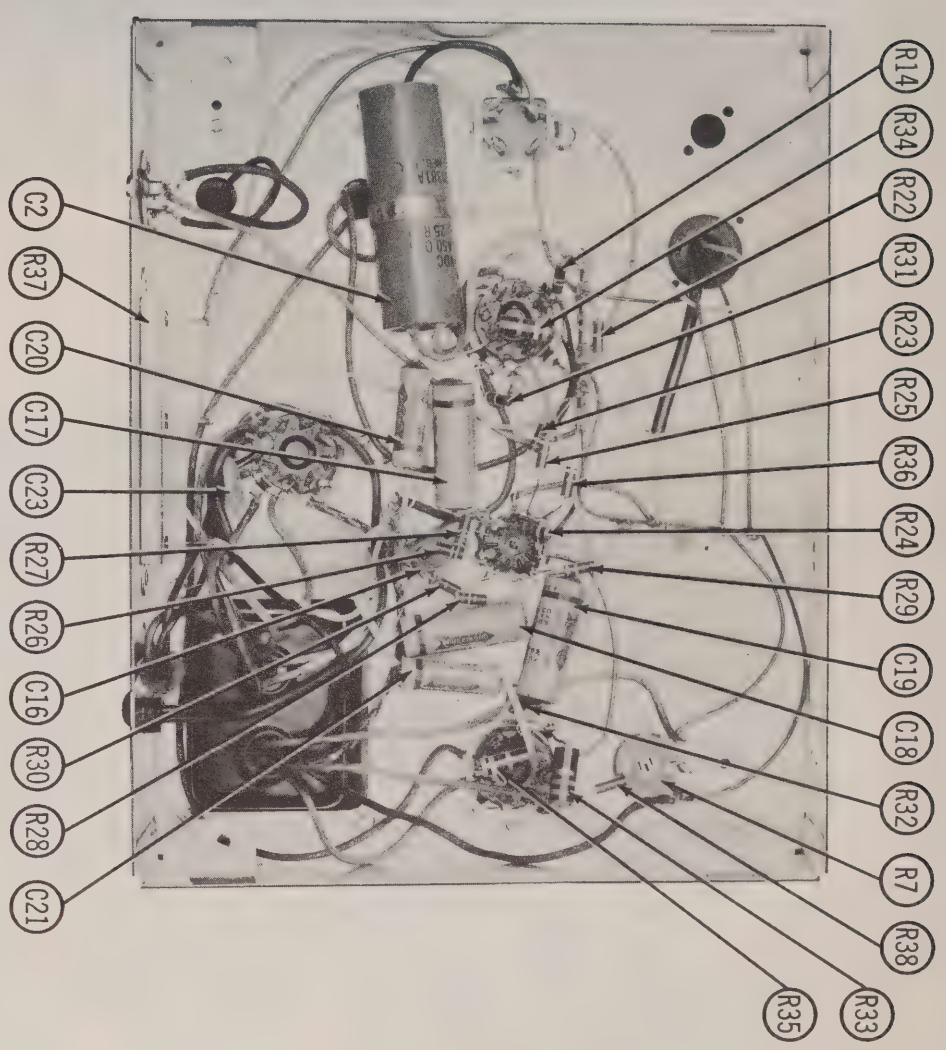
ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	CAPEHART PART No.	QUAM PART No.	RCA TYPE No.	
SP1	12"	PM	6-8Ω	850123A-5	12A10X		
SP2	12"	PM	6-8Ω	850315A-1			
SP3	5"	PM	3-4Ω	850275A-2	5A15TZ3.2		
SP4	5"	PM	3-4Ω	850275A-2	5A15TZ3.2		

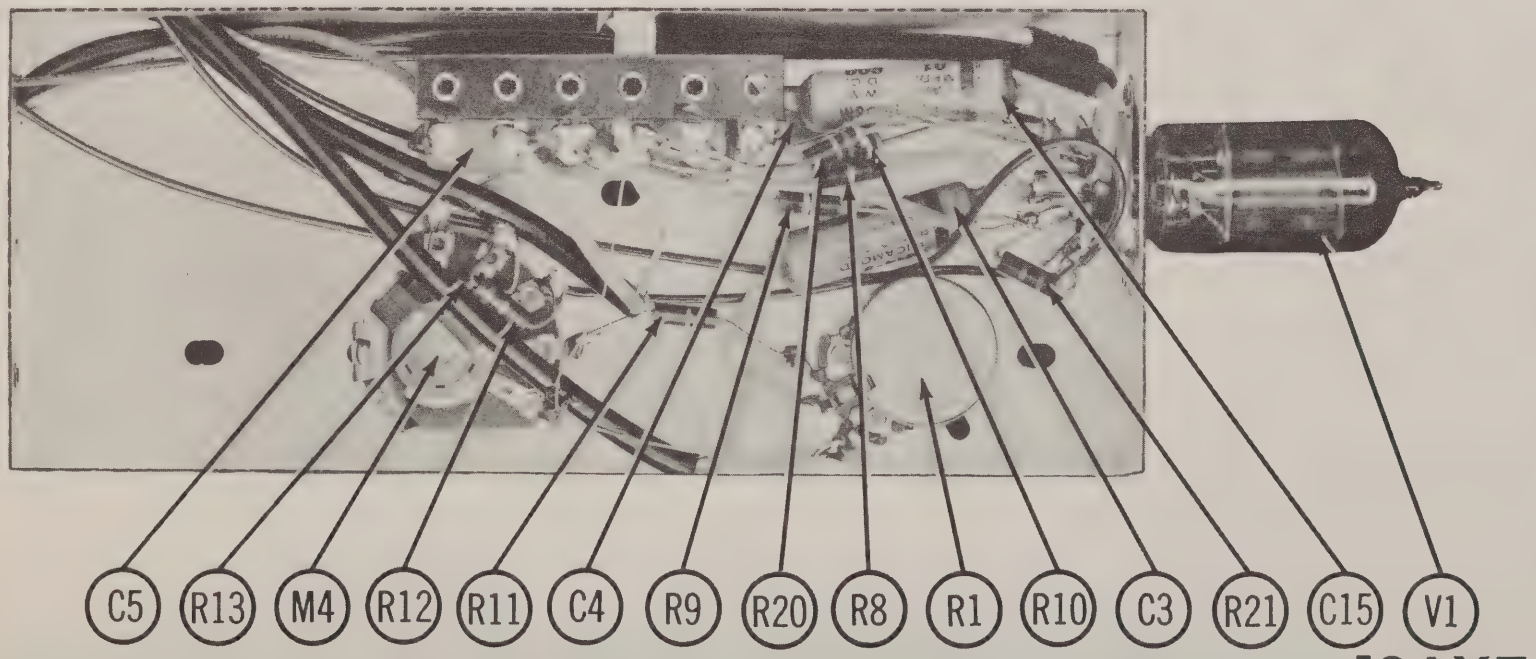
PHONO CARTRIDGE

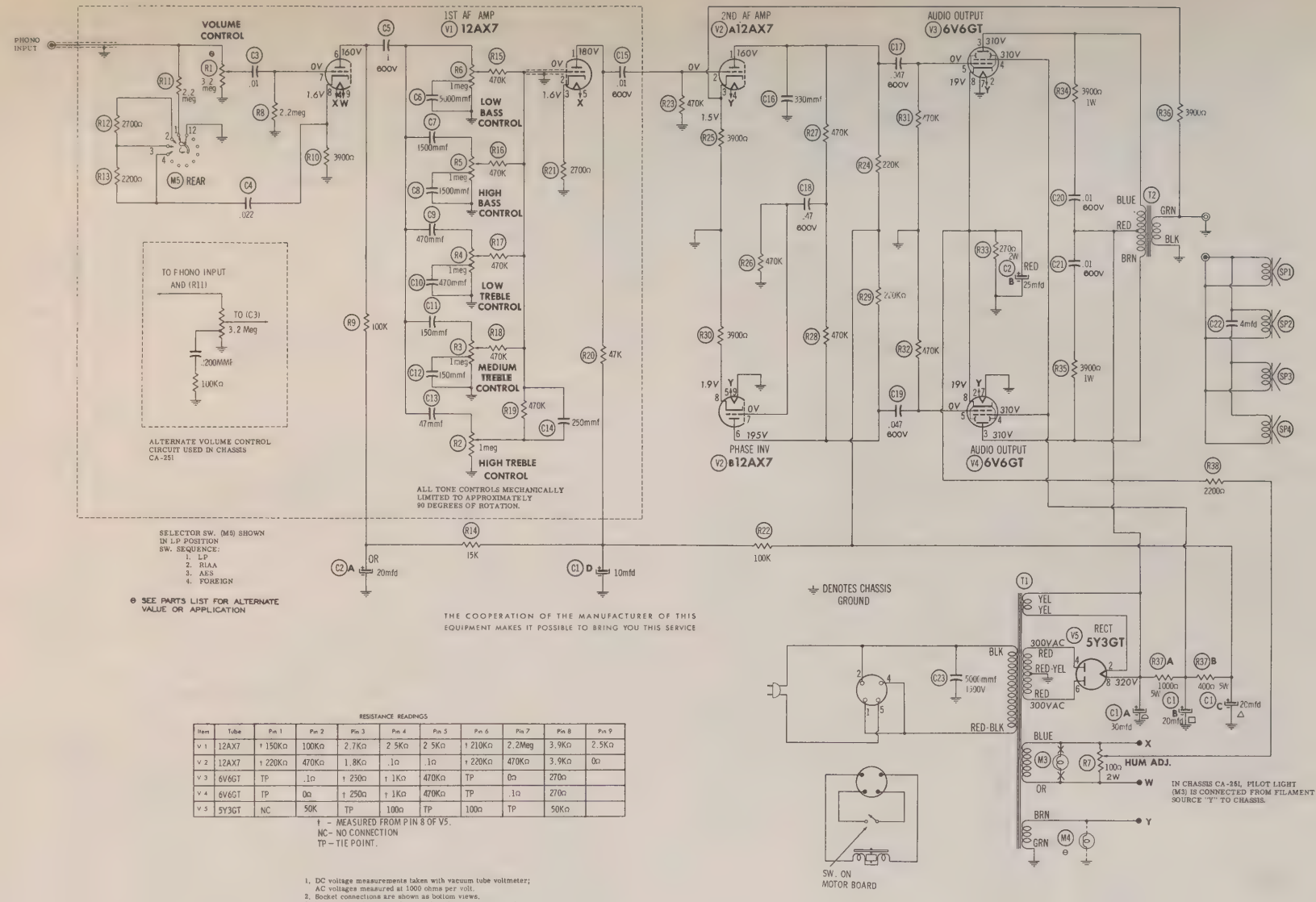
ITEM No.	REPLACEMENT DATA					REMARKS
	CAPEHART PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1	451683A-1			46-T	0-1 or S-1 and 0-3	

ELECTRO VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

CHASSIS—BOTTOM VIEW




C5
R13
M4
R12
R11
C4
R9
R20
R8
R1
R10
C3
R21
C15
V1
12AX7



THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12AX7	† 150KΩ	100KΩ	2.7KΩ	2.5KΩ	2.5KΩ	† 210KΩ	2.2Meg	3.9KΩ	2.5KΩ
V 2	12AX7	† 220KΩ	470KΩ	1.8KΩ	.1Ω	.1Ω	† 220KΩ	470KΩ	3.9KΩ	0Ω
V 3	6V6GT	TP	.1Ω	† 250Ω	† 1KΩ	470KΩ	TP	0Ω	270Ω	
V 4	6V6GT	TP	0Ω	† 250Ω	† 1KΩ	470KΩ	TP	.1Ω	270Ω	
V 5	5Y3GT	NC	50K	TP	100Ω	TP	100Ω	TP	50KΩ	

† – MEASURED FROM PIN 8 OF V5.
NC – NO CONNECTION
TP – TIE POINT.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PARTS LIST AND DESCRIPTIONS (Continued)

PHONO NEEDLE

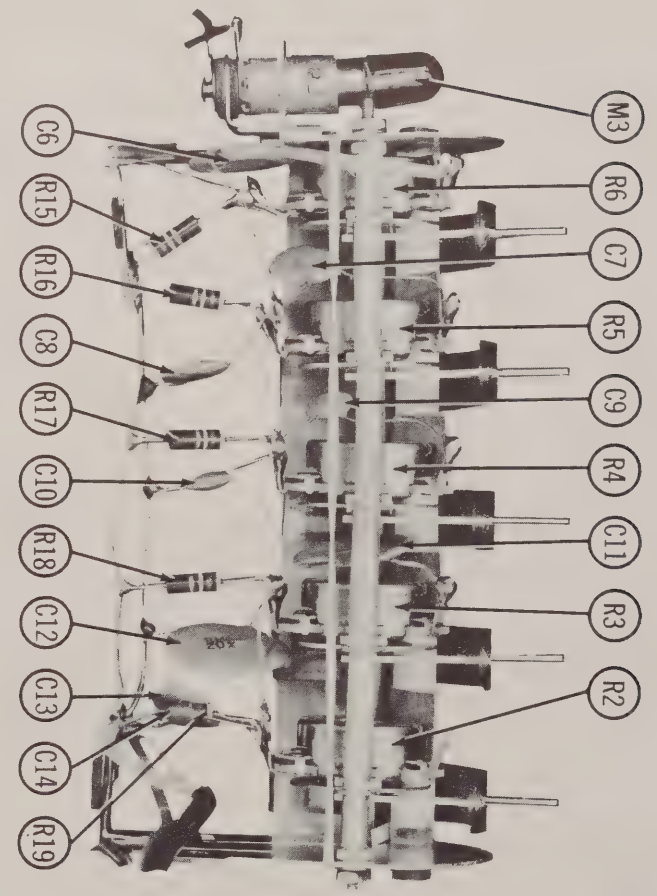
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	CAPEHART PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	
M2	451685A-1 (78RPM Needle)	† CR-55 or ♦CR-55D	† C-449 or ♦C-449D	† W-64S or ♦W-64D	† Jewel ♦ Diamond
	451684A-1 (33 1/3-45 Needle)	† CR-55LP or ♦CR-55LPD	† A-448 or ♦A-448D	† W-64MGS or ♦W-64MGD	

MISCELLANEOUS

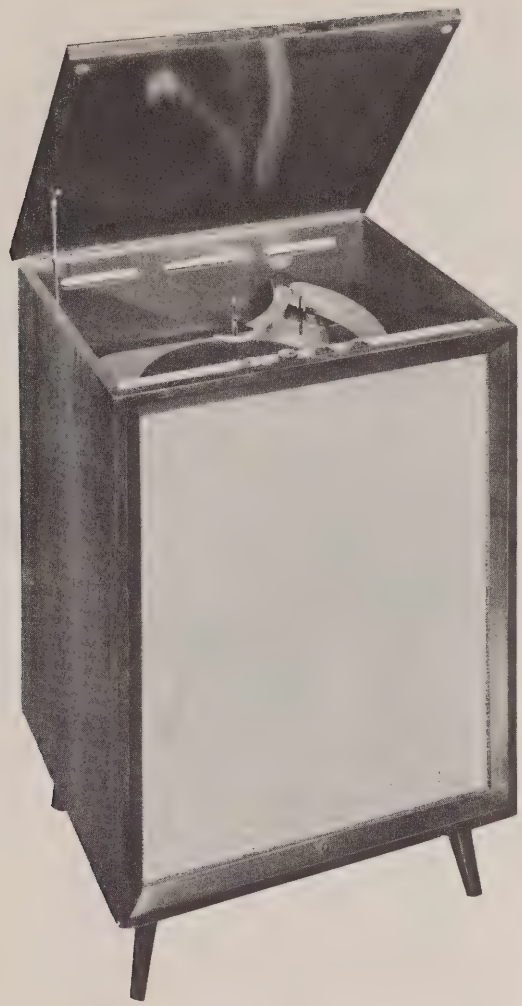
ITEM No.	PART NAME	CAPEHART PART No.	NOTES
M3	Pilot Light	600093A-8	#1847
M4	Jewel Light		Chassis CA-251 Only.
M5	Switch	454145A-1	Record Compensation (SP-4 Position, Rotary, Wafer Type). Chassis CA-241.
	Switch	454229A-1	Record Compensation (SP-4 Position, Rotary, Wafer Type). Chassis CA-251.
	Knob	650995A-2	Tone (5 Used). Chassis CA-241.
	Knob	650995A-3	Tone (5 Used). Chassis CA-251.
	Knob	651174A-4	On-Off-Volume. Chassis CA-251.
	Knob	651174A-1	On-Off-Volume. Chassis CA-241.
	Knob	651174A-2	Record Compensation Chassis CA-241.
	Knob	651174A-3	Record Compensation Chassis CA-251.

TONE CONTROL ASSEMBLY



COLUMBIA RECORDS MODEL 428

COLUMBIA RECORDS MODEL 428



COLUMBIA RECORDS MODEL 428

TRADE NAME	Columbia Records Model 428
MANUFACTURER	Columbia Records , 799 Seventh Ave., New York 19, N.Y.
TYPE SET	AC Operated Phono Amplifier With 3 Speed Automatic Record Changer
TUBES (Four)	Types 6C4 AF Amp., 12AX7 AF Amp.-Phase Inverter, (2) 6V6GT output
POWER SUPPLY	105-125 Volts AC-60 Cycles RATING .32 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE SIMILAR V-M MODEL 954B - PHOTOFACT SET 302-FOLDER 12.

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PARTS LIST AND DESCRIPTIONS
TUBES (GENERAL ELECTRIC, SYLVANIA)

COLUMBIA RECORDS
Model 428

ITEM No.	USE	REPLACEMENT DATA Columbia Records PART No.	REPLACEMENT DATA STANDARD REPLACEMENT	NOTES
V1	AF Amplifier	6C4	6C4	
V2	AF Amplifier-Phase Inverter	12AX7	12AX7	
V3	Output	6V6GT	6V6GT	
V4	Output	6V6GT	6V6GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA Columbia Records PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	50	200	(Note 1)	PRS250V50	BR5025	TC59	TD-50-450	MT-2540	TVA-1713
C2A	▲40	150		AFH3-147	C110	FP369.1	TMT144	T-725	TVL-3758
B	▬40	350							
C	■40	350							
C3	50	300	(Note 2)	PRS350V50	BR5035	TC79	TD-60-350	MT-4540	TVA-1713

Note 1. Some versions use 40MFD in this application.
Note 2. Some versions use 30MFD in this application.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA Columbia Records PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	47			SI47	D6-470	TP29	GP1K-470	UC-5447	5GA-Q47	
C5	100	500		SI100	D6-101	5W5T1	GP1K-101	MC235	1FM-31	
C6	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C7	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C8	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	Note 3
C9	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	Note 4
C10	270			SI270	D6-271	TP41	GP2K-271	UC-5327	5GA-T27	Note 4
C11	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C12	.047	200		BPD-05	DF-503	CUB2S47		PT4147	2TM-S47	
C13	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C14	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C15	.05	400		BPD-05	DF-503	CUB4S5		PT415	4TM-S5	
C16	.0047	400		SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C17	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C18	.0047	400		SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	

Note 3. Some versions use .01MFD in this application.
Note 4. Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Columbia Records PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	3Meg	½		AB-85	A47-3Meg-Z	Q13-140	U-57	Volume
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A
R2A	100KΩ	½		AB-41	A47-100K-Z	Q13-128	U-39	Treble
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R2A
R3A	100KΩ	½		AB-40	A47-100K-S	Q11-128	U-41	Bass
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R3A

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA Columbia Records PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R4	100KΩ	½		BTS-100K	
R5	4700Ω	½		BTS-4700	
R6	470KΩ	½		BTS-470K	
R7	68KΩ	½		BTS-68K	
R8	680Ω	½		BTS-680	
R9	68KΩ	½		BTS-68K	
R10	8.2Meg	½		BTS-8.2Meg	Note 1
R11	270KΩ	½		BTS-270K	
R12	3300Ω			BTS-3300	Note 1
R13	100Ω	½		BTS-100	
R14	8.2Meg	½		BTS-8.2Meg	Note 2
R15	270KΩ	½		BTS-270K	
R16	22KΩ	½		BTS-22K	
R17	270KΩ	½		BTS-270K	
R18	270KΩ	½		BTS-270K	
R19	100KΩ	½		BTS-100K	
R20	220Ω 5%	2			
R21	6.8Meg	½		BTS-6.8Meg	
R22	6.8Meg	½		BTS-6.8Meg	
R23	10KΩ	½		BTS-10K	
R24	10KΩ	1		BTA-10K	
R25	1000Ω	½		BTS-1000	
R26	220Ω 5%	2		BW2-220 5%	
R27	68Ω	½		BTS-68	
R28	68Ω	½		BTS-68	

Note 1. Not used in some versions.
Note 2. Some versions use 10Meg in this application.

PARTS LIST AND DESCRIPTIONS (Continued)
TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA Columbia Records PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @.32A	125VAC .070ADC	6.3VAC @1.5A		PT-1008					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA Columbia Records PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	8KΩ CT	3.3Ω	TR-117	Z1011	A-2904 ①	A-3830	22S56	S-55X	

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA Columbia Records PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	7"	PM	3.3Ω	SP-104	8A31	225S1	① Electrostatic speaker
SP2				SP-1 ①			

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA Columbia Records PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.070ADC		1004		6S100	5M1	100	
M2	.070ADC		1004		6S100	5M1	100	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA Columbia Records PART No. FUSE	Columbia Records PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M3	3AG	1A 250V			312001.(3AG-1A)	357001	AGC 1	4405

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA Columbia Records PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLE	REMARKS
M4		112-TS	A-1 & A-3	46-T	0-1 or S-1 & 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

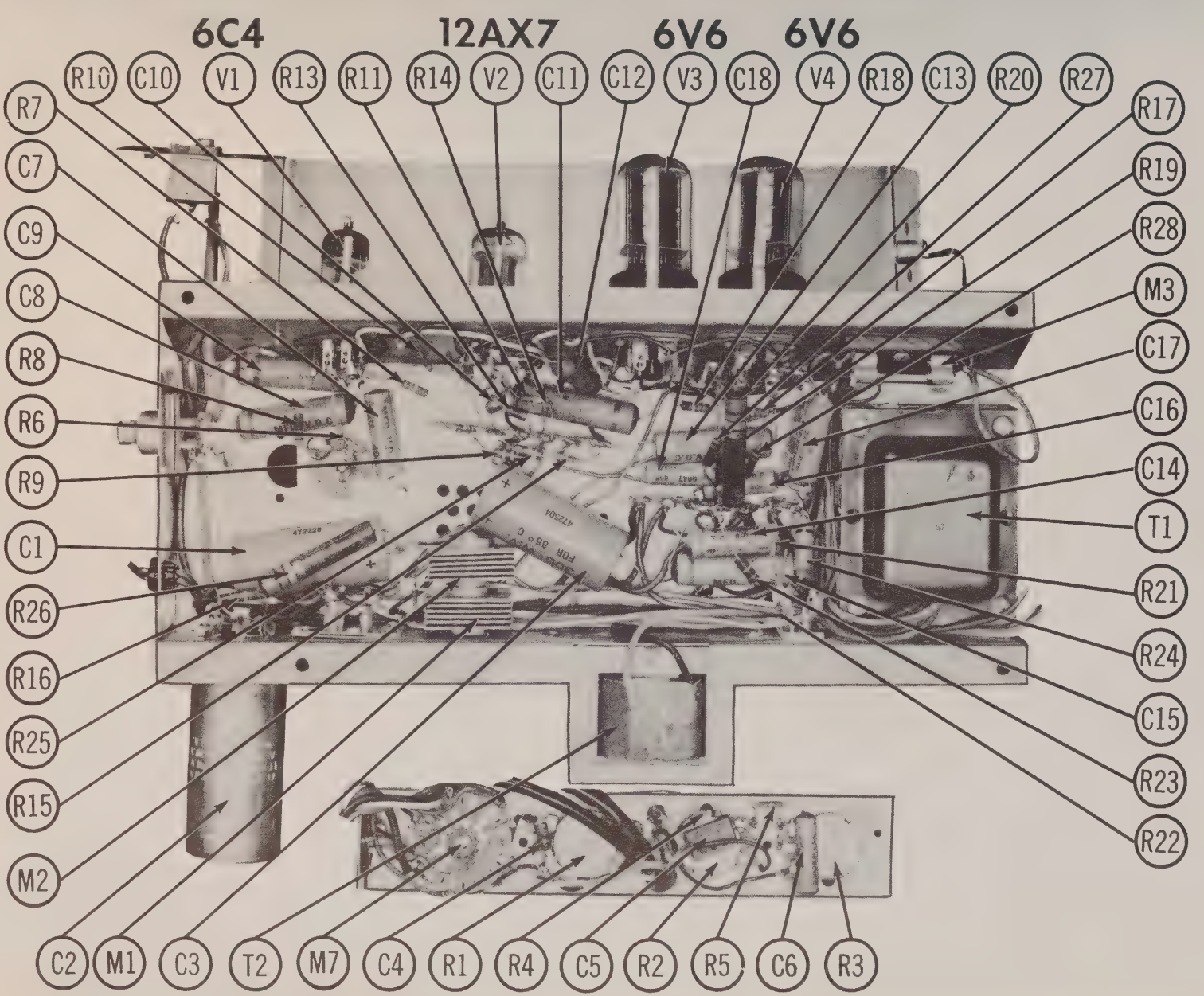
PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA Columbia Records PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M5		†CR-55 or ♦CR-55D and †CR-55LP or ♦CR-55LPD	†C-449 or ♦C-449D and †A-448 or ♦A-448D	†W-64S and †W-64MGS	† Jewel ♦ Diamond

MISCELLANEOUS

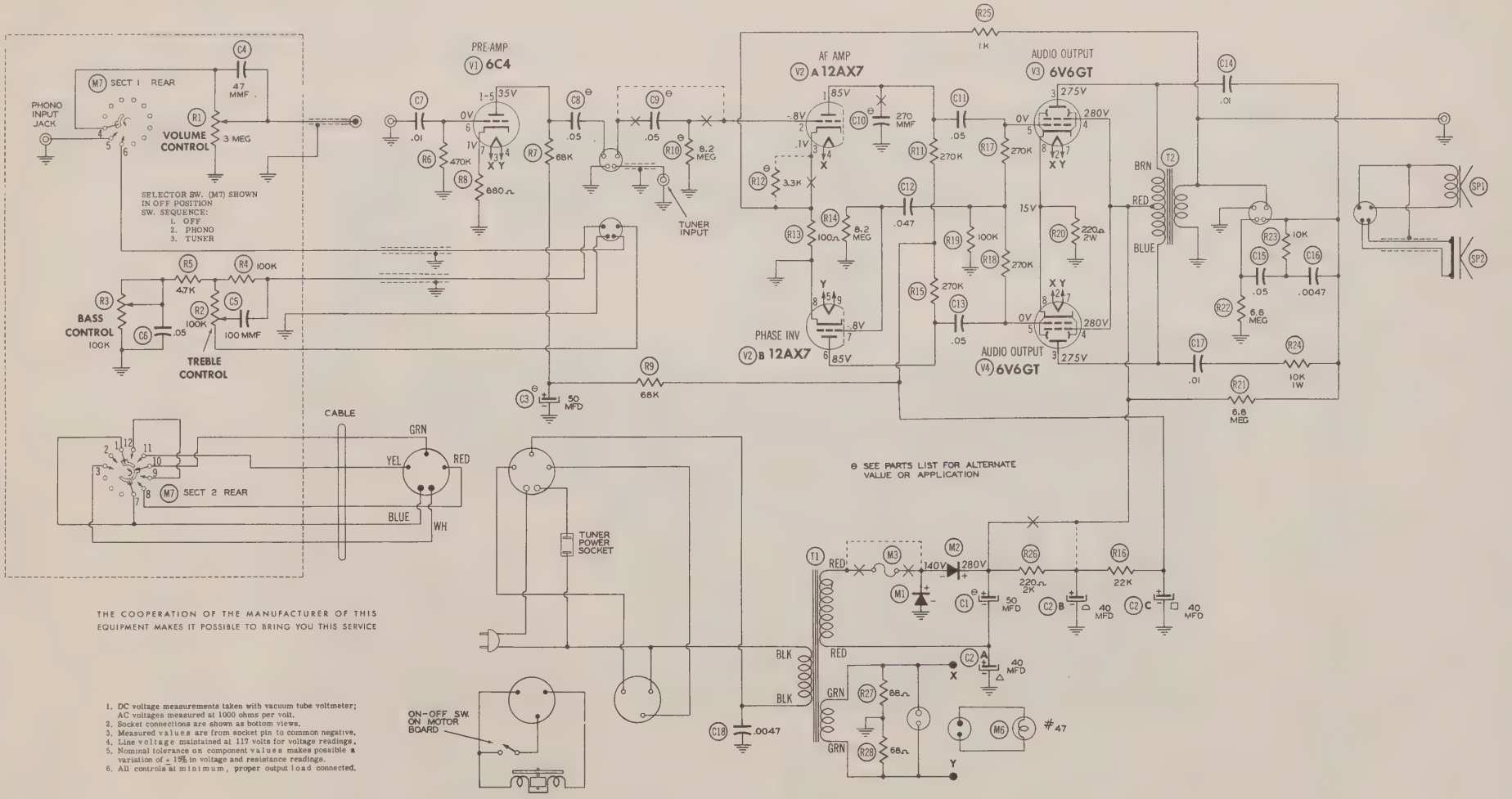
ITEM No.	PART NAME	Columbia Records PART No.	NOTES
M6	Pilot Light		#47
M7	Switch		Selector (Rotary-wafer type)



CHASSIS-BOTTOM VIEW

COLUMBIA RECORDS
Model 428

SET 320 FOLDER 6



THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6C4	*158KΩ	NC	34Ω	34Ω	*158KΩ	470KΩ	680Ω		
V 2	12AX7	*292KΩ	8.2Meg	100Ω	34Ω	34Ω	*292KΩ	8.2Meg	0Ω	34Ω
V 3	6V6GT	NC	34Ω	*190Ω	30KΩ	370KΩ	TP	34Ω	220Ω	
V 4	6V6GT	NC	34Ω	*190Ω	30KΩ	370KΩ	TP	34Ω	220Ω	

* MEASURED FROM OUTPUT OF M2.
NC - NO CONNECTION
TP - TIE POINT

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PHOTOFACT* Folder

*TRADE MARK

RETMA MEMBER

FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21T33), 13-G-193, 13-G-194 (Code 280-5-21T31)

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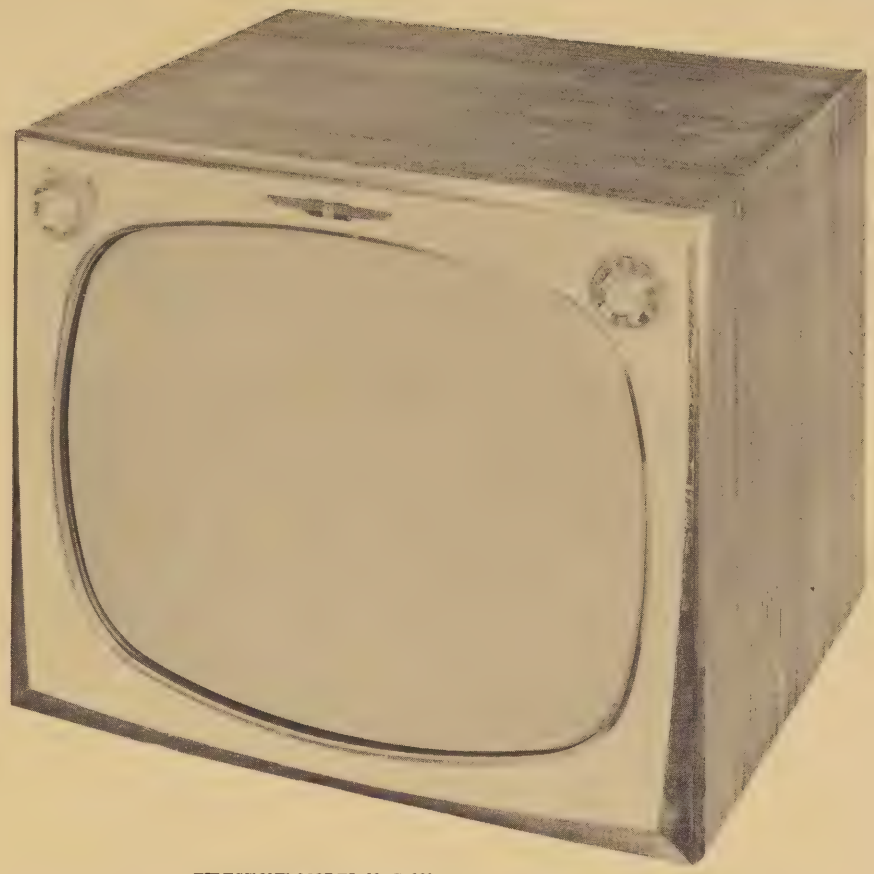

FIRESTONE MODEL 13-G-191

TRADE NAME	Firestone Models 13-G-191, 13-G-192 (Code 280-5-21T33) 13-G-193, 13-G-194 (Code 280-5-21T31)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron, Ohio
TYPE SET	Television Receiver
TUBES	Seventeen

POWER SUPPLY 105-115 Volts AC-60 Cycles RATING 1.7 Amp. @ 115 Volts AC

TUNING RANGE Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21T33), 13-G-193, 13-G-194 (Code 280-5-21T31)

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FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21T33), 13-G-193, 13-G-194 (Code 280-5-21T31)

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 7 push-on type control knobs from front panel of cabinet.

2. Remove 8 metal screws. Remove rear cover.

3. Remove 2 metal screws located behind channel selector and picture knobs.

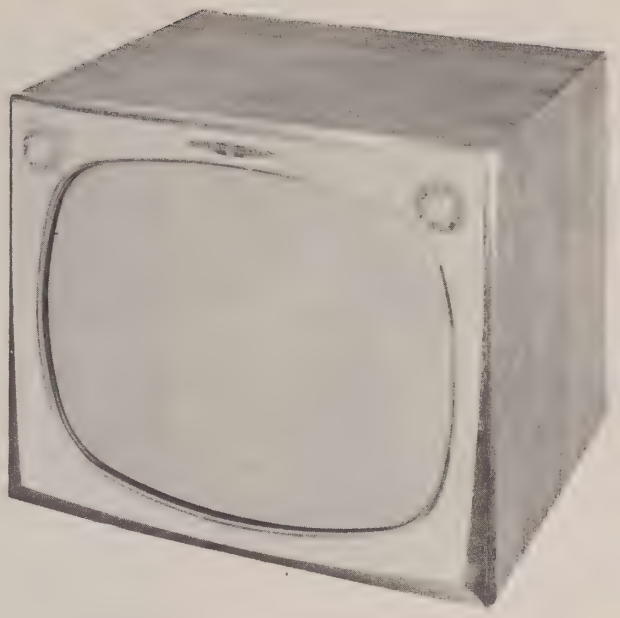
4. Place receiver face down on a soft surface.

5. Remove 2 metal screws from interlock and antenna bracket.

6. Disconnect speaker leads, HV lead, picture tube socket and yoke plugs.

7. Remove 4 chassis bolts. Remove chassis.

8. Remove 2 speaker nuts. Remove speaker.



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MODELS	CODE
13-G-191, 13-G-192	280-5-21T33
13-G-193, 13-G-194	280-5-21T31

FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21T33), 13-G-193, 13-G-194 (Code 280-5-21T31)

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator it is necessary to remove the rear cover and supply power to the set. Adjustment is located on the tube side of the chassis. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the buzz control located on the tube side of the chassis for maximum sound and MINIMUM buzz.

HORIZONTAL SIZE CONTROL

The horizontal size control is a brass sleeve located on the neck of the picture tube and slides between the yoke and the picture tube. Push sleeve into yoke to decrease size and pull out to increase size.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

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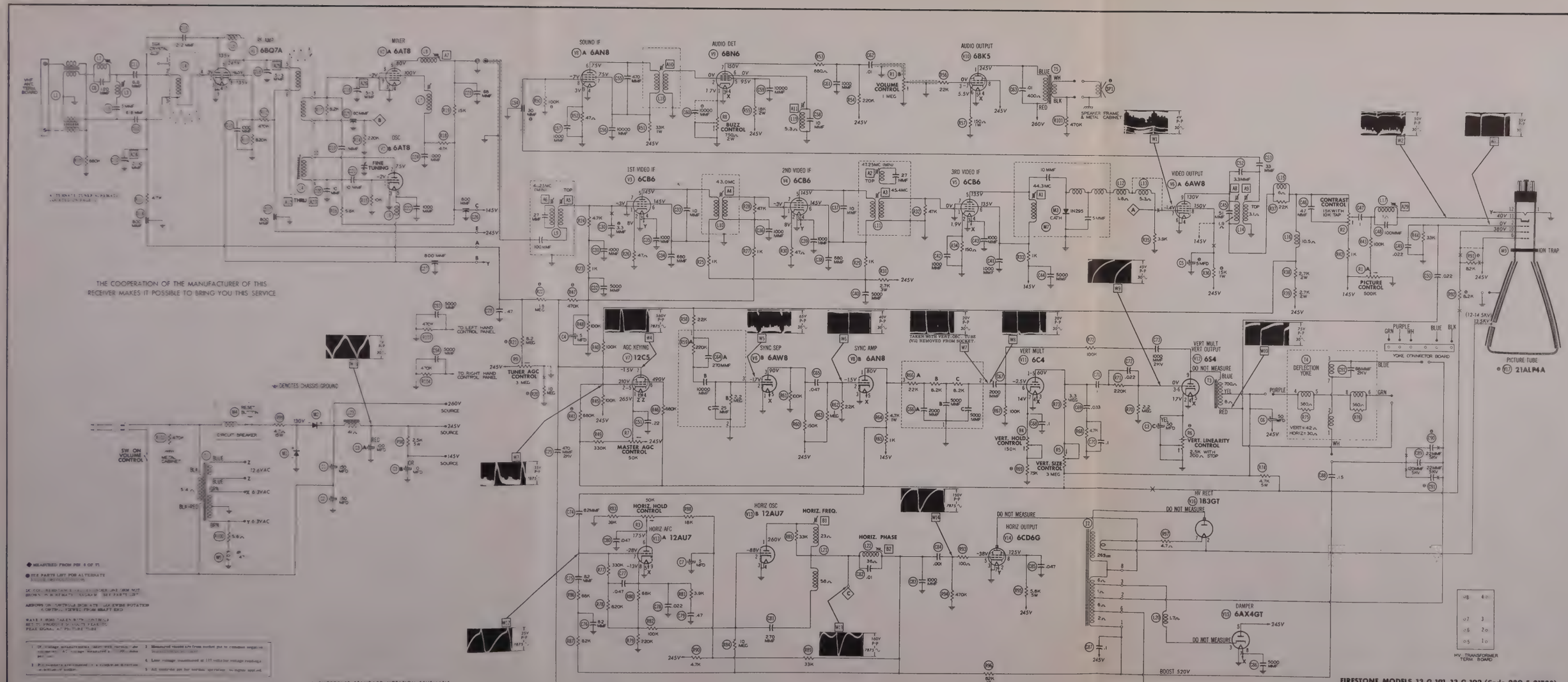
R. AMP. V2 6BQ7A
MIXER V3 A 6AT8
OSC V3 B 6AT8
FINE TUNING
SOUND IF V8 A 6AN8
AUDIO DET V5 6BN6
VOLUME CONTROL 1 MEG.
AUDIO OUTPUT V10 6BK5
SPEAKER FRAME & METAL CABINET
1ST VIDEO IF V3 6CB6
2ND VIDEO IF V4 6CB6
3RD VIDEO IF V5 6CB6
VIDEO OUTPUT V6 A 6AW8
CONTRAST CONTROL 15K WITH 10K TAP
PICTURE CONTROL 500K
ION TRAP
PICTURE TUBE V17 21ALP4A
YOKE CONNECTOR BOARD
DEFLECTION YOKE
AGC KEYING V7 12C5
MASTER AGC CONTROL 50K
TUNER AGC CONTROL 3 MEG.
SYNC SEP V8 B 6AW8
SYNC AMP V8 B 6AN8
VERT MULT V11 6C4
VERT. HOLD CONTROL 150K
VERT. SIZE CONTROL 3 MEG
VERT MULT VERT OUTPUT V12 6S4 DO NOT MEASURE
VERT. LINEARITY CONTROL 2.5K WITH 700 Ω STOP
HORIZ. HOLD CONTROL 50K
HORIZ AFC V13 A 12AU7
HORIZ OSC V13 B 12AU7
HORIZ. FREQ.
HORIZ. PHASE
HORIZ OUTPUT V14 6CD6G
HV RECT V16 1B3GT DO NOT MEASURE
DAMPER V15 6AX4GT DO NOT MEASURE
BOOST 520V
HV TRANSFORMER TERM. BOARD
TO LEFT HAND CONTROL PANEL
TO RIGHT HAND CONTROL PANEL
DENOTES CHASSIS GROUND
SW. ON VOLUME CONTROL
CIRCUIT BREAKER
260V SOURCE
245V SOURCE
145V SOURCE
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
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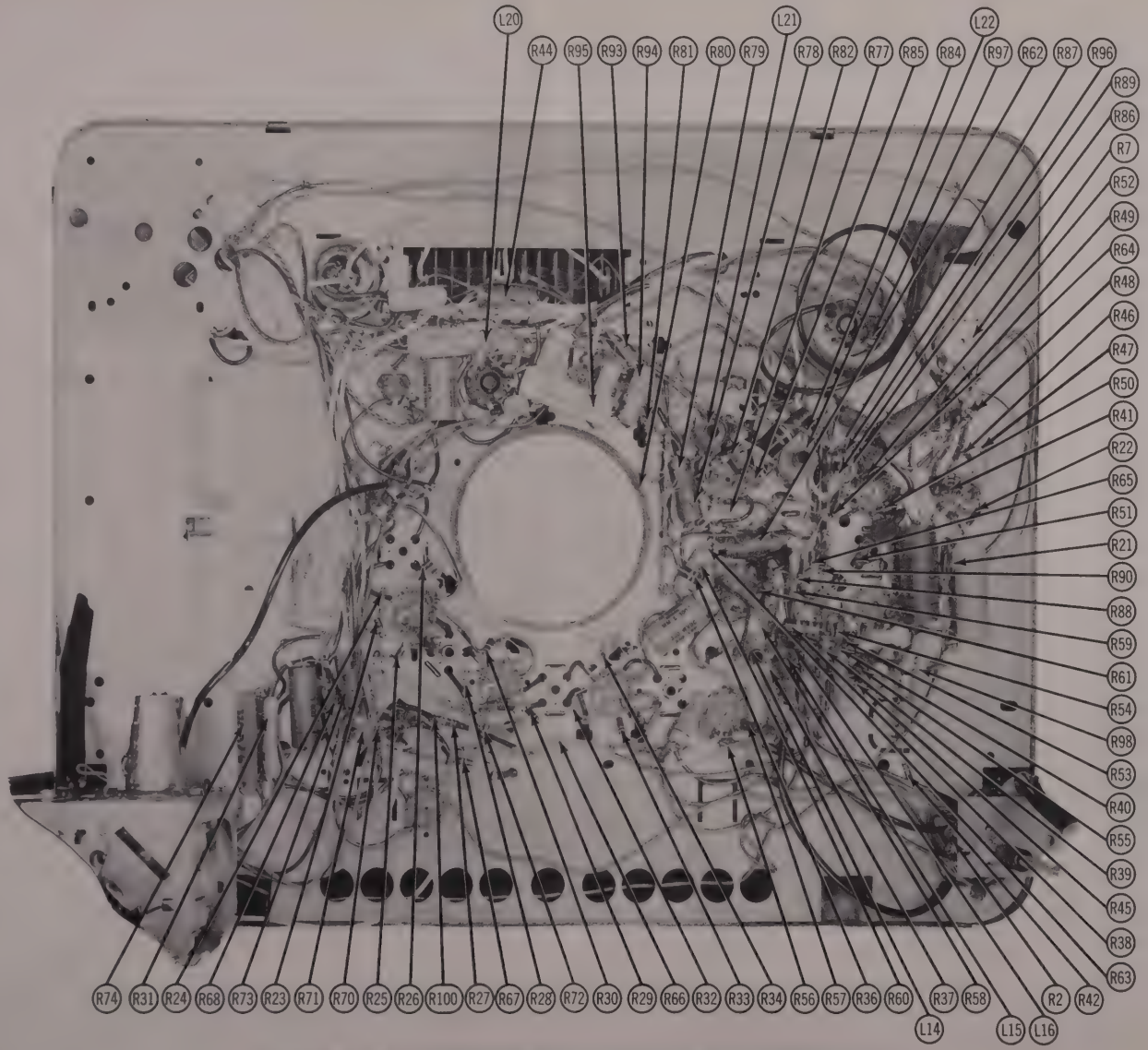
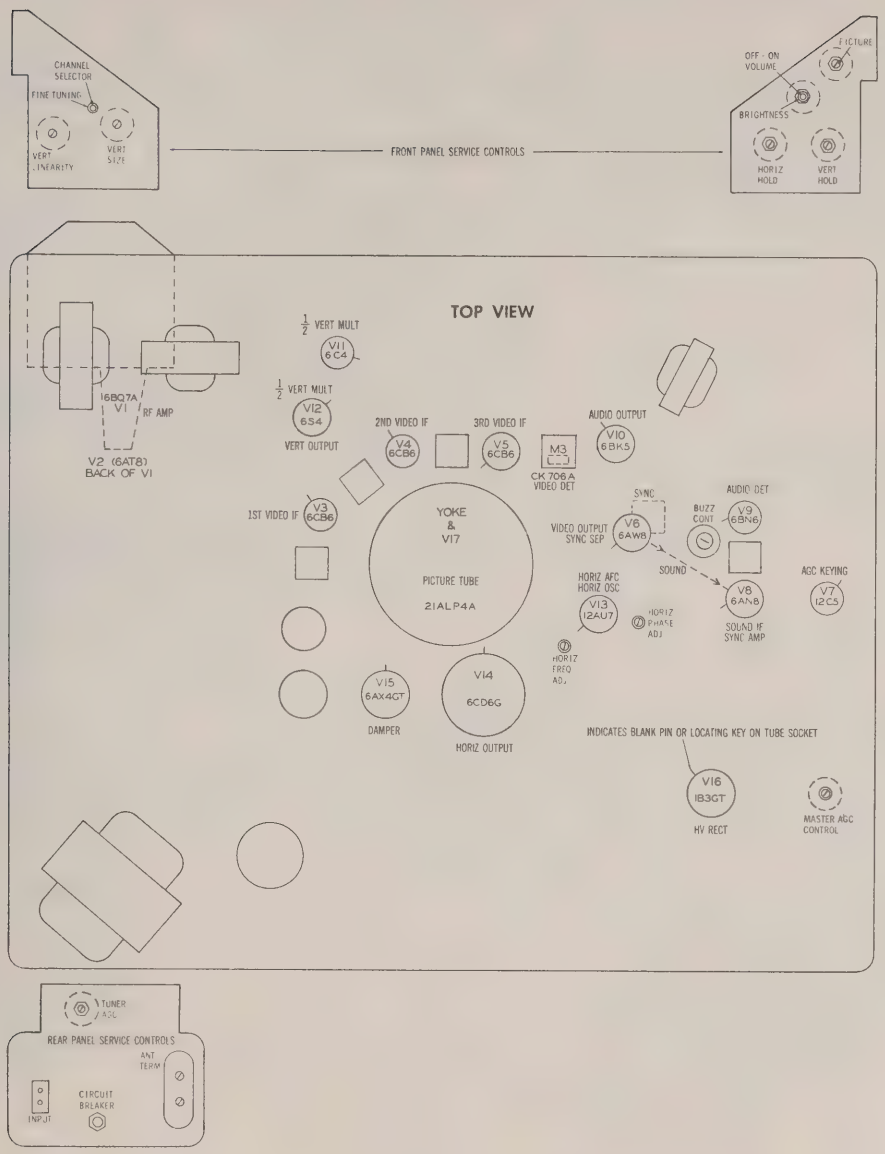


CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **Selenium Rectifiers (M1 & M2), Circuit Breaker (M4)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V6, V7, V17**
Has pic, no sound - **V8, V9, V10**
Overloaded picture - **V7**

SYNC FAILURE
No vert. sync - **V8, V11, V12**
No horiz. sync - **V8, V13**
No vert. or horiz. sync - **V6, V8**

SWEEP FAILURE
No raster, has sound - **V13, V14, V15, V16, V17**
No vertical deflection - **V11, V12**
Poor vert. linearity or foldover - **V11, V12**
Poor horiz. linearity or foldover - **V13, V14, V15**
Narrow picture - **V13, V14, V15, V16, M1, M2**
Vert. off freq. - **V8, V11, V12**
Horiz. off freq. - **V8, V13**

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
The high voltage lead should be securely taped and kept away from chassis. Do not remove the horizontal oscillator tube (V13) to disable the high voltage.

VIDEO IF ALIGNMENT

The local oscillator should be disabled to reduce the possibility of erroneous indications. This may be done by removing the bottom tuner shield of the VHF tuner and placing a piece of transparent cellulose tape across the first two contacts (from front of VHF tuner) of an unused channel strip and then switching the tuner to this insulated channel strip.
Connect a .001MFD capacitor across the vertical input terminals of the oscilloscope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	300 MFD	High side to pin 1 (grid) of 6CB6 (V3). Low side to chassis	Not used	44.5MC Unmod.	Any	Use VTVM. DC probe to point Ⓐ. Common to chassis.	A1	Attenuate generator output not to exceed 2 volts at VTVM. Adjust for maximum deflection.
2.				47.25MC			A2	Adjust for MINIMUM deflection.
3.				45.4MC			A3	Adjust for maximum deflection. Repeat step 2.
4.				43.0MC			A4	Adjust for maximum deflection.
5.			43.0MC (30MC Swp.	42.5MC 45.6MC		Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.		Use only enough sweep generator output for useable pattern on scope. Check for response curve similar to Fig. 1. If necessary, retouch A1 thru A4 for desired response.
6.	Direct	High side to an ungrounded tube shield floating [illegible] Low side to chassis	Not used	41.25MC Unmod.		Use VTVM. DC probe to point Ⓐ. Common to chassis	A6	Adjust for MINIMUM deflection.
7.			43.0MC (30MC Swp.	41.25MC 42.5MC 45.6MC 47.25MC		Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis	A5, A7	Adjust A6 and A7 for response curve similar to Fig. 2. 42.5MC and 45.6MC marker should best 50% on response curve. Adjust A6 for proper bandwidth and position of 42.5MC and 45.6MC markers. Adjust A7 for maximum amplitude and MINIMUM tilt. Increase generator output to observe 41.25MC and 47.25MC traps. If necessary, SLIGHTLY retouch A6 and A2 for correct 41.25MC and 47.25MC trap positions. If unable to obtain correct response curve as in Fig. 2, repeat steps 1 thru 7.

SOUND IF ALIGNMENT

Remove the strip of transparent cellulose tape from tuner strip and replace tube shield over converter tube.
Tune in a TV station and adjust the fine tuning control until the sound bars just appear in the picture. Adjust A8 fully counter clockwise, then clockwise until the horizontal screening lines are smooth and continuous. Readjust the fine tuning control for clearest picture and best sound.
Insert an attenuator in series with the antenna terminals so that the signal strength may be varied from weak to strong. If a suitable attenuator is not available, stray feed the signal to the receiver by placing the antenna lead near the antenna terminals. Reduce the signal strength input to the receiver so that the signal falls below the limiting level of the 6BN6 (V9) as evidenced by a hiss in the sound. Adjust the secondary of the sound take-off transformer (A9), the ratio detector coil (A10), the quadrature coil (A11), and the bass control (R8) for maximum sound and minimum buzz. If hiss disappears while making adjustments, increase attenuation until hiss reappears.

VHF OSCILLATOR ALIGNMENT

Connect the negative lead of a 1.5 volt battery to the tuner AGC. Connect positive lead to chassis. The channel oscillator adjustment screws are reached through a hole just below the channel switch shaft (on VHF/UHF Tuner; hole extends through UHF Tuner). The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	211MC (30MC Swp.)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 3. Video marker should be at 50%.
			205MC (30MC Swp.	205.25MC 209.75MC	12		A13	
			199MC (30MC Swp.	199.25MC 203.75MC	11		A14	
			193MC (30MC Swp.	193.25MC 197.75MC	10		A15	
			187MC (30MC Swp.	187.25MC 191.75MC	9		A16	
			181MC (30MC Swp.	181.25MC 185.75MC	8		A17	
			175MC (30MC Swp.	175.25MC 179.75MC	7		A18	
			83MC (30MC Swp.	83.25MC 87.75MC	6		A19	
			77MC (30MC Swp.	77.25MC 81.75MC	5		A30	
			69MC (30MC Swp.	69.25MC 73.75MC	4		A21	
			63MC (30MC Swp.	63.25MC 67.75MC	3		A22	
			57MC (30MC Swp.	57.25MC 61.75MC	2		A23	

FIG. 1

FIG. 2

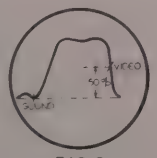


FIG. 3

FIG. 4

FIG. 5

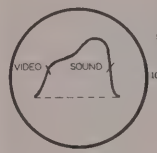


FIG. 6A

FIG. 6B

VHF RF AND MIXER ALIGNMENT

Connect bias as under "VHF Oscillator Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	199MC (60MC Swp.)	193.25MC 197.75MC	10	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A24, A25, A26	Adjust for response curve similar to Fig. 4 with markers above 90%.
10.	"	"	213MC (10MC Swp.)	211.25MC 215.75MC	13	"		If markers fall below 70% on any channel make compromise adjustments of A24, A25 and A26 with channel switch set to that channel. Then recheck all other channels to see that they have not been seriously affected.
			207MC (10MC Swp.)	205.25MC 209.75MC	12			
			201MC (10MC Swp.)	199.25MC 203.75MC	11			
			195MC (10MC Swp.)	193.25MC 197.75MC	9			
			189MC (10MC Swp.)	187.25MC 191.75MC	8			
			183MC (10MC Swp.)	181.25MC 185.75MC	7			
			177MC (10MC Swp.)	175.25MC 179.75MC	6			
			85MC (10MC Swp.)	83.25MC 87.75MC	5			
			79MC (10MC Swp.)	77.25MC 81.75MC	4			
			69MC (10MC Swp.)	67.25MC 71.75MC	3			
			63MC (10MC Swp.)	61.25MC 65.75MC	2			
			57MC (10MC Swp.)	55.25MC 59.75MC				

UHF TUNER ALIGNMENT

Connect bias as under "VHF Oscillator Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50Ω.
Set the channel selector to UHF position.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across UHF antenna terminals with 120Ω in each lead.	600MC	Not used	35	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A38	Use only enough sweep generator output to provide useable pattern on scope. Adjust for maximum amplitude of response curve similar to Fig. 5.

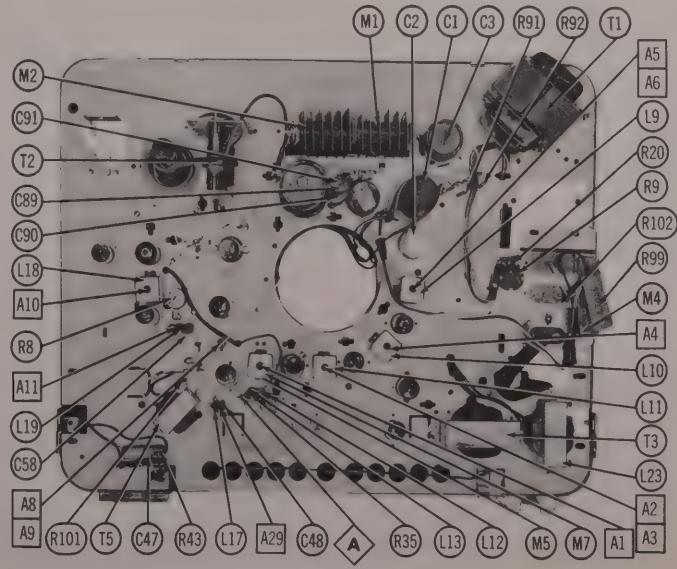
Check response curve on channels 14 and 80. Response curve for channel 14 should be similar to Fig. 6A. Response curve for channel 80 should be equal with opposite tilt as in Fig. 6B. If not, SLIGHTLY retouch A28 until this condition is obtained.

IF WAVETRAP ADJUSTMENT

The IF wave trap should be tuned to minimize interference caused by signals which fall within the video IF bandpass (40-48MC). Tune in a TV station on which interference is noted, and adjust A27 for minimum interference in the picture.

4.5MC TRAP ADJUSTMENT

Tune in a TV station and adjust A29 for minimum 4.5MC beat in the picture.



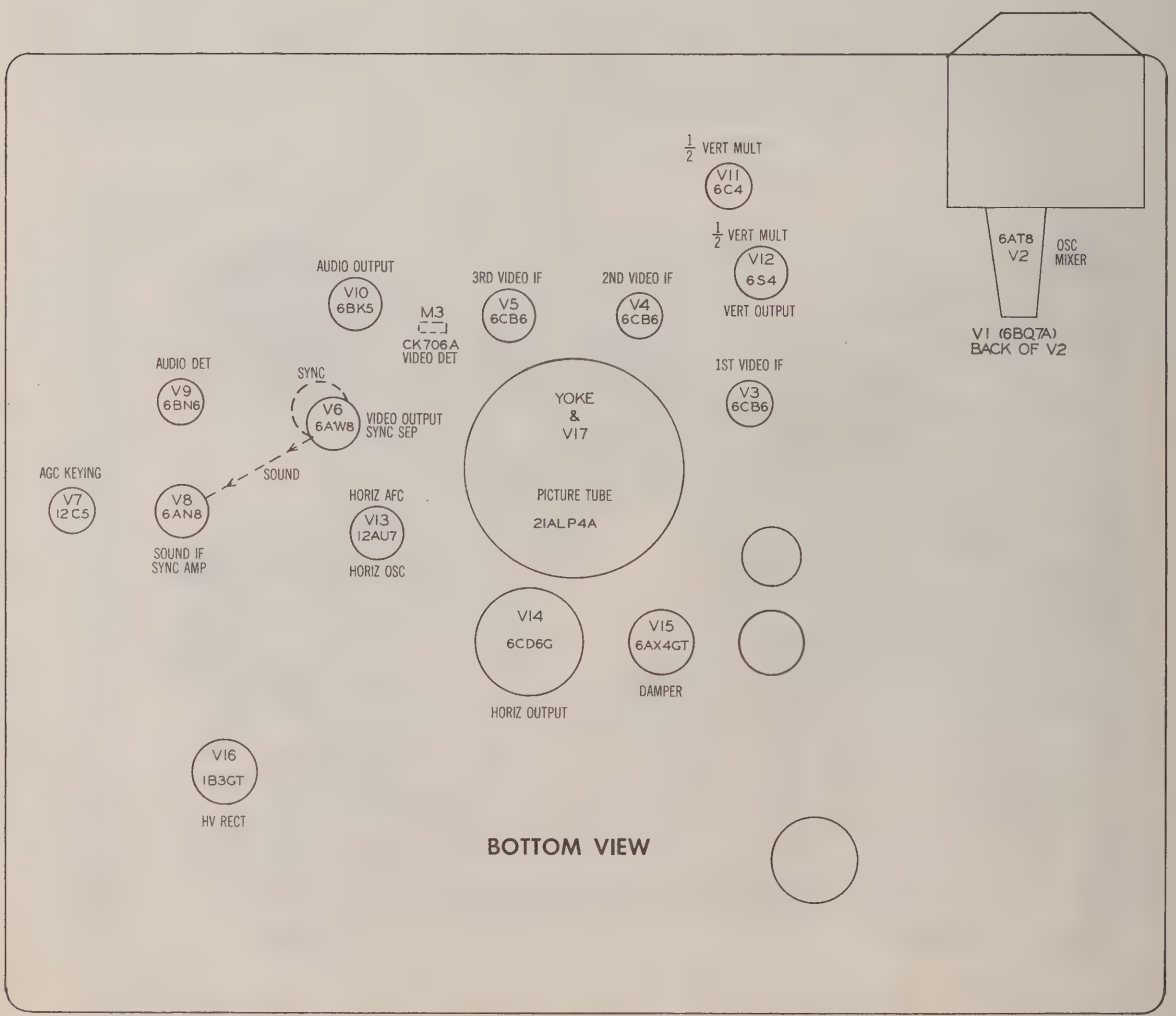
CHASSIS TOP VIEW

FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21T33), 13-G-193, 13-G-194 (Code 280-5-21T31)

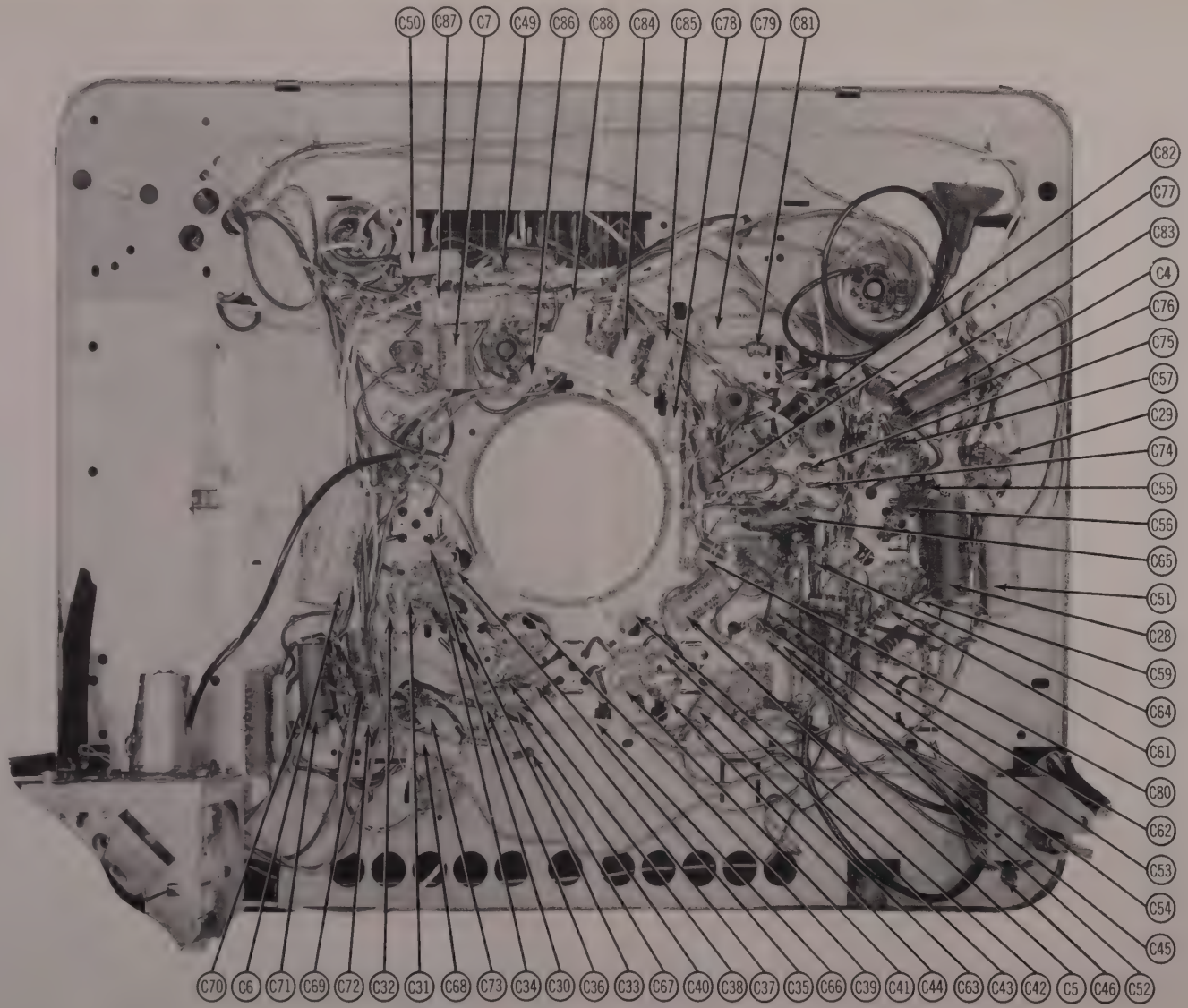
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	INF	1. 7Meg	0Ω	0Ω	. 1Ω	† 41Ω	280KΩ	INF	0Ω
V 2	6AT8	10KΩ	† 8KΩ	0Ω	0Ω	. 1Ω	† 18KΩ	† 50KΩ	0Ω	220KΩ
V 3	6 CB6	100KΩ	47Ω	0Ω	. 1Ω	† 3. 7KΩ	† 3. 7KΩ	0Ω		
V 4	6CB6	100KΩ	47Ω	0Ω	. 1Ω	† 3. 7KΩ	† 3. 7KΩ	0Ω		
V 5	6CB6	. 1Ω	150Ω	0Ω	. 1Ω	† 3. 5KΩ	† 3. 5KΩ	0Ω		
V 6	6AW8	0Ω	2. 2Meg	† 70KΩ	0Ω	. 1Ω	0Ω	3. 7KΩ	† 15KΩ	† 4KΩ
V 7	12C5	▲ 70KΩ	† 50KΩ	INF	INF	† 50KΩ	▲ 680KΩ	500KΩ		
V 8	6AN8	† 8. 2KΩ	22KΩ	0Ω	0Ω	. 1Ω	† 33KΩ	† 33KΩ	100KΩ	47Ω
V 9	6BN6	350Ω	. 4Ω	0Ω	. 1Ω	† 18KΩ	5. 3Ω	† 220KΩ		
V 10	6BK5	† 400Ω	NC	400KΩ	. 1Ω	0Ω	150Ω	400KΩ	† 41Ω	TP
V 11	6C4	5Meg	NC	. 1Ω	0Ω	▲ 5Meg	100KΩ	150KΩ		
V 12	6S4	NC	700Ω	2. 2Meg	0Ω	. 1Ω	2. 2Meg	NC	NC	▲ 4. 7KΩ
V 13	12AU7	▲ 40KΩ	300KΩ	0Ω	0Ω	0Ω	† 20KΩ	1. 3Meg	280KΩ	. 1Ω
V 14	6CD6G	TP	. 1Ω	0Ω	TP	470KΩ	TP	0Ω	† 5. 6KΩ	TOP CAP ▲ 8Ω
V 15	6AX4GT	NC	NC	70KΩ	NC	† 41Ω	TP	0Ω	. 1Ω	
V 16	1B3GT		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲ 2. 75Ω
V 17	21ALP4A	0Ω	33KΩ	PIN 6 † 41Ω	PIN 10 ▲ 50KΩ	PIN 11 † 200KΩ	PIN 12 . 1Ω			

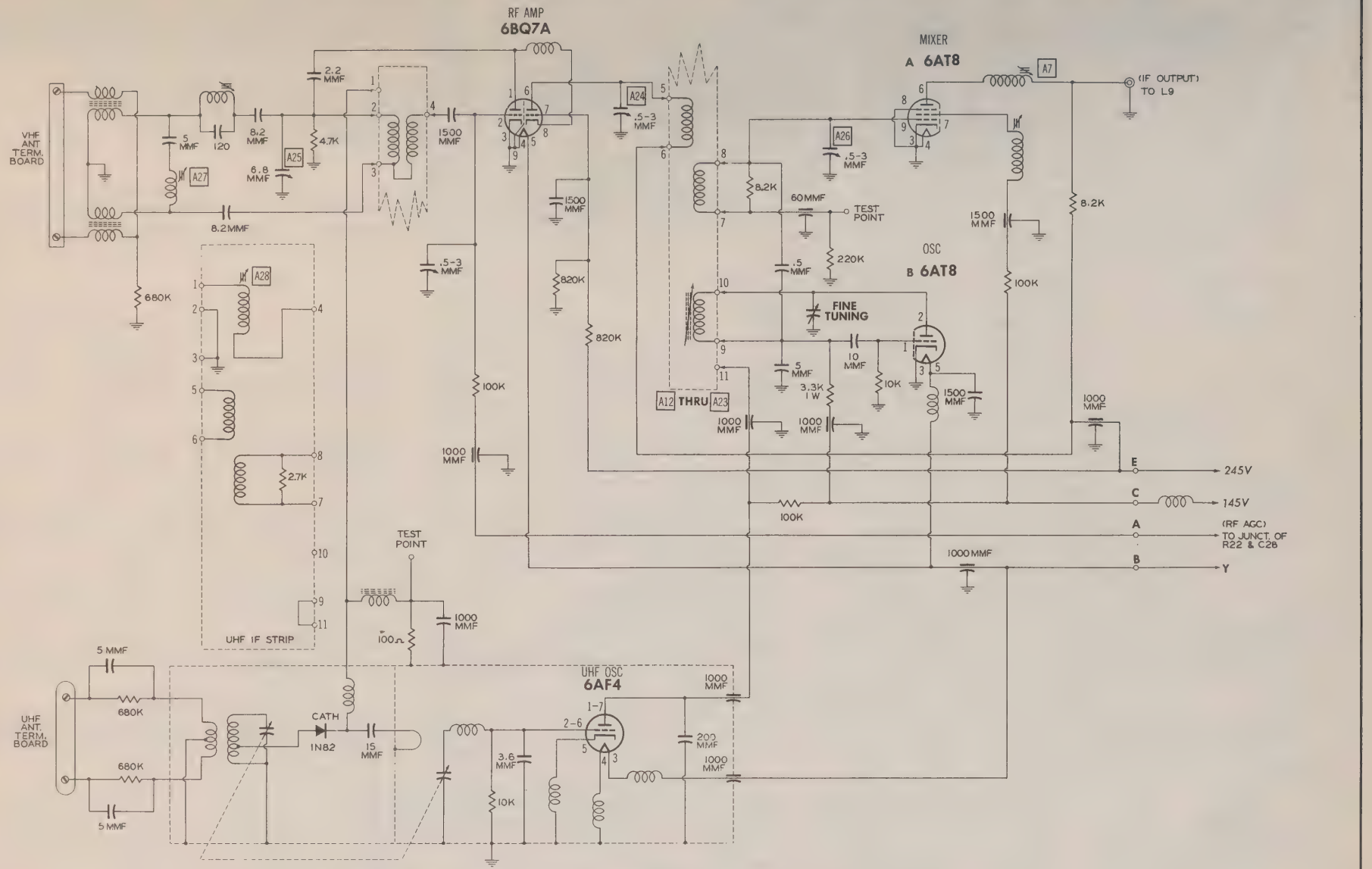
† MEASURED FROM OUTPUT OF M2.
▲ MEASURED FROM PIN 3 OF V15.
TP-TIE POINT.
NC-NO CONNECTION.



TUBE PLACEMENT CHART



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



UHF - VHF TUNER PART NO. 211-25475 USED WITH CHASSIS 21T31

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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ALTERNATE VHF - UHF TUNER SCHEMATIC

FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21133), 13-G-193, 13-G-194 (Code 280-5-21131)

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	NOTES
V1	RF Amplifier	6BQ7A	6BQ7A	
V2	Mixer-Oscillator	6AT8	6AT8	
V3	Ist. Video IF Amplifier	6CB6	6CB6	
V4	2nd. Video IF Amplifier	6CB6	6CB6	
V5	3rd. Video IF Amplifier	6CB6	6CB6	
V6	Video Output-Syn Separator	6AW8	6AW8	
V7	AGC Keying	12C5	12C5	
V8	Sound IF Amplifier-Sync Amplifier	6AN8	6AN8	
V9	Audio Detector	6BN6	6BN6	
V10	Audio Output	6BK5	6BK5	
V11	Vert. Mult.	6C4	6C4	
V12	Vert. Mult.-Vert. Output	6S4	6S4	
V13	Horiz. AFC-Horiz. Osc.	12AU7	12AU7	
V14	Horiz. Output	6CD6G	6CD6G	
V15	Damper	6AX4GT	6AX4GT	
V16	HV Rectifier	1B3GT	1B3GT	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: FIRESTONE PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	NOTES
V17	21ALP4A ①	21ALP4A ①	21ALP4A ①	21ALP4A ①	① Aluminized ② Silver screen "85"
			21ALP4A /B ②	21ALP4A / B ②	
		21ALP4B ①			
		21ALP4	21ALP4		
	21ATP4 ①	21ATP4 ①		21ATP4 ② 21ATP4A ②	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	SPRAGUE PART No.
C1	150	150	8C-23464	AFHSL-70	XB004	FP117	TM-150-150	T-050	TVL-1428
C2	150	150	8C-22463	AFHSL-70	XB004	FP117	TM-150-150	T-050	TVL-1428
C3A	300	300	8C-25308	RE1042	D002	WQ635	TM-3137	T-537	R2227 *
B	30	300			BR505			MT-0525	
C	50	50							
C4	5	350	8C-20557	PRS350V4	BR435	TC60	TD-8-350	FM-3508	TVA-1601
C5	5	300	8C-24174 (Note 1)	PRS350V4	BR435	TC60	TD-8-350	FM-3508	TVA-1601
C6	50	350	8C-25532	PRS350V50	BR505	TC75	TD-50-450	FM-4540	TVA-1712
C7	5	300	8C-24174	PRS350V4	BR435	TC60	TD-8-350	FM-3508	TVA-1601

Note 1 Not used in some versions
* Unit must be ordered from manufacturer.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No	SPRAGUE PART No.	NOTES
C8	120		1068-24336	DM0012	DD-121	G044	811-121	UC-5312	5GA-T12	
C9	5		10"S-25740	NPO-D15	TCZ-4R7	Z011	NPOA-050	ZT-555	5TCCB-V47	
C10	6.8		1058-25265	NPO-D68 8	TCZ-6R8	Z013	NPOA-6R8	ZT-5568	5TCCB-V68	
C11	6.8		1058-25265	NPO-D68 8	TCZ-6R8	Z013	NPOA-6R8	ZT-5568	5TCCB-V68	
C12	2-10		1058-25252							
C13	2.2		1068-25254	NPO-S22.2	TCZ-2R2	Z008	NPOA-2R2		5TCCB-V22	
C14	2.2		1068-25223							
C15	1000		10"S-25748	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C16	.5-5		1058-25223		S28-3		3139-01-0R5	CT565A		
C17	600		1058-25233							
C18	.5-5		1068-25223		S28-3		3139-01-0R5	CT565A		
C19	1		1068-25852	NP6-S11	TCE-1	TE08	NPOA-010		5TCCB-V1	
C20	10		1068-25268							
C21	10		1058-25387							
C22	1000		10"S-25748	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C23	600		1058-24523	N750-S168	TCH-68	N068	NT501-680		5TCU-Q68	
C24	1000		10"S-25748	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C25	60		1058-25366							
C26	600		1058-25233							
C27	600		1068-25233							
C28	.47	300		P2S8N-47			CUS2P47	PT4047	2TM-P47	
C29	470	2000	8C-24699	HVD-30-470	DD20-471	V47-47	3KV-471	DC30547	30GA-T47	
C30	3.3			NP0-S33 3	TCZ-3R3	Z006	NPOA-3R3	ZT-5533	5TCCB-V33	Note 2
C31	1000			BPD-001	DD-102	K060	801-001	DC-521	5HK-D1	
C32	5000			BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C33	10			N750-S10	TCH-10	T005	N750A-100	MT-541	5TCU-Q1	
C34	600			S28G0	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C35	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C36	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C37	10			N750-S10	TCH-10	T005	N750A-100	MT-541	5TCU-Q1	
C38	600			S28G0	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C39	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C40	5000			BPD-005	DD-502	K080	801-005	DC-525	5HK-D5	
C41	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C42	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C43	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C44	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C45	51			N330-S547	TCA-47		N330L-470			
C46	47			P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C47	1	600		NP0-S1100	TCZ-100	TZ30	801-101	MC8235	5TCC-T1	
C48	100			BPD-02	DF-203	CUB4S21	817-02	PT4123	4TM-S23	
C49	.022	200		BPD-02	DF-203	CUB4S21	817-02	PT4123	4TM-S23	
C50	.022	600		BPD-02	DF-203	CUB4S23	817-02	PT4133	4TM-S33	
C51	.33	600		P4S8N-22		CUB4P22		PT4023	4TM-P23	
C52	2.2			NP0-S22.2	TCZ-2R2	TZ06	NPOA-220	ZT-5522	5TCCB-V22	
C53	33			NP0-S330	TCZ-33	TZ18	NPOL-330	ZT-5533	5TCC-Q33	
C54	30		MB-25713							Note 3
C55	470			1469-00047	DD-471	SR5T47	811-471			
C56	10000			BPD-01	DD-103	KD83	811-01	DC-511	5HK-E1	
C57	1000			BPD-001	DD-102	K069	801-001	DC-521		
C58	10			NP0-S10	TCZ-10	Z018	NPOA-100	ZT-541	5TCC-Q1	
C59	10000			BPD-01	DD-103	KD83	811-01	DC-511	5HK-E1	
C60	10000			BPD-01	DD-103	KD83	811-01	DC-511	5HK-E1	Note 2
C61	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C62	.01	600		BPD-01	D6-103	CUB681	GP3-333-103	PT611	4TM-S1	
C63	.01	600		BPD-01	D6-103	CUB681	GP3-333-103	PT611	6TM-S1	
C64A	270					TP41	811-271	UC-5327	5GA-T27	
B	1000		†17A-34212	†PA-533	†PC-383	K068	811-01	DC-511	5HK-E1	
C	30					TP25	GP1K-280	UC-5435	5GA-Q35	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: FIRESTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No	SPRAGUE PART No.	NOTES
C65	.047	200		BPD-05	DF-503	CUB3S47		PT4147	3TM-S47	
C66A	2000							DC-522		
B	5000		♦17A-23376	♦PA-110	♦PC-100	♦1S7TM1	♦1406-01	DC-525	♦V-1	
C	5000							DC-525		
C67	2000			S12000	D6-202	TP56	801-002	UC-522	5HK-D2	
C68	.1	200		P2S8N-1	DF-104	CUB2P1		PT401	2TM-P1	
C69	.033	400		BPD-03	DF-303	CUB6S33		PT4133	6TM-S33	
C70	.1	200		P2S8N-1	DF-104	CUB2P1		PT401	2TM-P1	
C71	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C72	.022	200		BPD-02	DF-203	CUB4S23	817-02	PT4123	2TM-S23	
C73	1000	2000	SG-24691	HVD-30-1000	DD30-102	V1D1	3KV-102	DC-3051	30GA-D1	
C74	82			1469-000082	TCZ-82	22R5Q82	NP0-337-820		MS-482	
C75	82			1469-000082	TCZ-82	22R5Q82	NP0-337-820		MS-482	
C76	82			1469-000082	TCZ-82	22R5Q82	NP0-337-820		MS-482	
C77	.047	200		BPD-05	DF-503	CUB3S47		PT4147	3TM-S47	
C78	.022	200		BPD-02	DF-203	CUB4S23	817-02	PT4123	2TM-S23	
C79	.047	200		P2S8N-47		CUB4P47		PT4047	2TM-P47	
C80	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C81	270			NP0-S270	TCZ-270	22R5T27	811-271		MS-327	
C82	.01	600								
C83	1000			1464-001		1R5D1	811-102	MC8235	MS-31	
C84	.001	600		BPD-001	D6-102	CUB6D1	GP2L-102	PT621	6TM-D1	
C85	.047	400		BPD-05	DF-503	CUB6S47		PT4147	4TM-S47	
C86	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C87	.1	800		P6S8N-1	DF-104	CUB6P1		PT601	6TM-P1	
C88	.15	200		P2S8N-15		CUB2P15		PT4015	2TM-P15	
C89	120	5000	SG-25325		DD30-121				30GA-T12	
C90	22	5000		HVD60-22					50GA-Q22	Note 2
C91	22	5000		HVD60-22					50GA-Q22	Note 2
C92	68	2000		HVD30-68	DD30-680	V3Q68	3KV-680	DC30468	30GA-Q68	
C93	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C94	5000			BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	

Note 2 Not used in some versions.
Note 3 C54 is capacity of shielded sound IF coupling lead.
† Items C64A, C64B, C64C, R59A and R59B are combined in one unit.
♦ Items C66A, C66B, C66C, R66A, R66B and R66C are combined in one unit.

CONTROLS

ITEM No	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: FIRESTONE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500kΩ	½	B10A-25471	F1-40	RTV-574		UF55L	Picture (Panel)
B	1Meg	½		R2-52			UR16A	Volume (Rear)
C	Switch			KB-1			UB-36	Attach to R1B.
R2A	15kΩ	½	B10B-25472	ABT-154		Q1T-118X	UF55L	Contrast Tapped at 10kΩ.
B	Shaft		Not Req.	AK-4		Not Req.		Attach to R2A.
R3A	500kΩ	½	B10B-25169	AB-31	A47-50K-S	Q1L-123	U-35	Horiz. Hold
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R3A.
R4A	150kΩ	½	B10B-25168	AB-43	A47-150K-S	Q1L-129	U-43	Vert. Hold
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R4A.
R5A	3Meg	1	B10B-25167	B-84	A47-3Meg-S	Q1I-140	U-59	Vert. Size
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R5A.
R6A	2500Ω with 2000 stop	1	B10B-25805	♦B-7	♦A47-2500Z	♦Q1I-112	♦TA352L	Vert. Linearity
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R6A.
R7A	50kΩ	½	B10B-25894	AB-31	A47-50K-S	Q1L-123	TA54L	Master AGC
B	Shaft		Not Req.	AK-19	FKS-1	Not Req.	Not Req.	Attach to R7A.
R8	750Ω	2	A10D-23857		39-800			Buss-Wire Wound
R9A	3Meg	½	B10A-25667	B-84-S	A47-3Meg-S	Q1I-140	U-59	Tuner AGC
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R9A.
C	Switch		Not Req.	Not Req.	8WS-12	T6-1	UB-36	Attach to R9A.

♦ Connect a 2200 resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control (control viewed from shaft end, terminals down).

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R10	680kΩ	½			
R11	470Ω	1		BTS-4700	
R12	470kΩ	½		BTS-470K	
R13	820kΩ	½		BTS-820K	
R14	220kΩ	½		BTS-220K	
R15	180Ω	2		BTS-18R	
R16	5600Ω	1		BTS-5600	
R17	8200Ω	½		BTS-8200	
R18	47kΩ	½		BTS-47K	
R19	15kΩ	½		BTS-15K	
R20	10Meg	½		BTS-10Meg	Note 1
R21	6.2Meg	½		BTS-6.2Meg	Note 2
R22	1.6Meg	½		BTS-1.6Meg	Note 3
R23	1000Ω	½		BTS-1000	
R24	4700Ω	½		BTS-4700	
R25	1000Ω	½		BTS-1000	
R26	47Ω	½		BTS-47	
R27	1000Ω	½		BTS-1000	
R28	47kΩ	½		BTS-47K	
R29	100Ω	½		BTS-100	
R30	47Ω	½		BTS-47	
R31	2700Ω	3	9C11-1104		
R32	47kΩ	½		BTS-47K	
R33	1000Ω	½		BTS-1000	
R34	150Ω	½		BTS-150	
R35	3900Ω	½		BTS-3900	
R36	15kΩ	½		BTS-15K	Note 1
R37	22kΩ	½		BTS-22K	
R38	2700Ω	3		BTB-2700	
R39	2700Ω	3		BTB-2700	
R40	100kΩ	½		BTS-100K	
R41	680kΩ	½		BTS-680K	Note 4
R42	1000Ω	½		BTS-1000	
R43	100kΩ	½		BTS-100K	
R44	33kΩ	½		BTS-33K	
R45	100kΩ	½		BTS-100K	
R46	680kΩ	½		BTS-680K	
R47	470kΩ	½		BTS-470K	Note 5
R48	100kΩ	½		BTS-100K	
R49	330kΩ	½		BTS-330K	
R50	100kΩ	½		BTS-100K	Note 6

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R51	33kΩ	½		BTA-33K	
R52	47Ω	½		BTS-47	
R53	680Ω	½		BTS-680	
R54	220kΩ	½		BTS-220K	
R55	18kΩ	2		BTS-18K	
R56	22kΩ	½		BTS-22K	
R57	150Ω	½		BTA-150	
R58	22kΩ	½		BTS-22K	
R59A	220kΩ	½	† 17A-34212	BTS-220K	
B	2.2Meg			BTS-2.2Meg	
R60	150kΩ	½		BTS-150K	
R61	100kΩ	½		BTS-100K	
R62	22kΩ	½		BTS-22K	
R63	1Meg	2		BTS-1Meg	
R64	4700Ω	½		BTA-4700	
R65	1000Ω	½		BTS-1000	
R66A	22kΩ	½		BTS-22K	
B	8200Ω	½	♦ 17A-23376	BTS-8200	
C	8300Ω	½		BTS-100K	
R67	100kΩ	½		BTS-4700	
R68	470Ω	½		BTS-75K 5%	
R69	75kΩ 5%	½		BTS-2.2Meg	Note 7
R70	2.2Meg	½		BTS-220K	
R71	220kΩ	½		BTS-100K	
R72	100kΩ	½		BTS-3.3Meg	
R73	3.3Meg	½			
R74	4700Ω	½	9C13-1107		
R75	560Ω	½			
R76	560Ω	½			
R77	330kΩ	½		BTS-330K	
R78	820kΩ	½		BTS-820K	
R79	220kΩ	½		BTS-220K	
R80	68kΩ	½		BTS-68K	
R81	3900Ω	½		BTS-3900	
R82	100kΩ	½			
R83	36kΩ	½			
R84	10Meg	½			
R85	33kΩ	½			
R86	68kΩ	½		BTS-68K	
R87	82kΩ	½		BTS-82K	
R88	18kΩ	½			

RESISTORS (cont)

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R89	33kΩ	½		BTS-33K	
R90	4700Ω	½		BTS-4700	
R91	82kΩ	½		BTS-82K	Note 1
R92	82kΩ	½		BTS-82K	Note 1
R93	100Ω	½		BTS-100	
R94	470kΩ	½		BTS-470K	
R95	560Ω	5	9C12-1108		
R96	82kΩ	1		BTA-82K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: FIRESTONE PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R97	4.7Ω	½	9C1-1071	BW-4.7	
R98	2500Ω	5	9C-24033	PW7-2500	
R99	4.7Ω 5%	15	9C-25668		
R100	5.6Ω	½	9C1-1072	BW-5.6	
R101	470kΩ	½		BTS-470K	
R102	470kΩ	½		BTS-470K	
R103	470kΩ	½		BTS-470K	
R104	470kΩ	½		BTS-470K	

Note 1. Not used in some versions.
Note 2. Some versions use a 10Meg ½W resistor in this application.
Note 3. Some versions use a 1.2Meg ½W resistor in this application.
Note 4. Some versions use a 1Meg ½W resistor in this application.
Note 5. Some versions use a 390kΩ ½W resistor in this application.
Note 6. Some versions use a 470kΩ ½W resistor in this application.
Note 7. Some versions use a 68kΩ ½W resistor in this application.
† Items R59A, R59B, C64A, C64B, C64C are combined in one unit.
♦ Items R66A, R66B, R66C, C66A, C66B, C66C are combined in one unit.

TRANSFORMER (POWER)

ITEM No	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No
T1	117VAC .73A	12.6V 4.0A	12.6V .6A		12D-25564					

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No	RCA TYPE No.	Ram PART No	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	Horiz. Output Trans.	12E-25424	FB448 *	HVO-58 *		X126 *		FLY-80 *	D-83 *
T3	Vert. Output Trans.	12E-19048-2	Z1900	A-3038	222T1	V305	A-8143	Z6553	A-99X
T4A	Yoke(90°)Horiz.(59MH)	20I-25360	DF607	MDF-92	23SD1	Y90F19/43	DY-16A	Y-16	Y-41-1
B	Vert.(40MH)	16M-23770							

1 Connect as auto transformer.
2 Use 10 to 1 turns ratio.
3 Drill new mounting hole(s).
4 Includes capacitor C92. Resistors R75 and R76.
5 Yoke rear cover and centering device.
6 Use original rear cover and centering device.
7 Loosen and rotate core clamp to duplicate original shield mounting.
8 Connect horizontal damping network across terminals #3 and #7. Use original if necessary.
9 Use original horizontal yoke damping network if necessary.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	8	8	8	8	8		8	8
	3	3	6	6	6	6	6	3
	6	6	3	3	3		3	6
	1	2	2	2			2	2
Special Notes			10		10			

⑩ Change AGC coupling capacitor C29 to approximately 30 to 70MMF @ 3KV.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No.	NOTES
T5	6.5kΩ	3-4Ω	12C-24170	Z1004	A2931	A3878	24S52	5-51X	

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA: FIRESTONE PART No.	QUAM PART No.	RCA TYPE No	NOTES
SP1	5"	PM	3-4Ω	18A-25935	5A07	20S82	
				18A-24683 ①	5A07	20S52	① Use as alternate speaker.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No	MILLER PART No.	NOTES
L1A	Ant. Matching Trans.	0Ω	0Ω					
B	Ant. Matching Trans.	0Ω	0Ω	1078-25754				
L2	IF Trap	.2Ω		1068-25848				
L3	FM Trap	0Ω		1078-25756				
L4A	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-2				Channel 2
B	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-3				Channel 3
C	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-4				Channel 4
D	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-5				Channel 5
E	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-6				Channel 6
F	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-7				Channel 7
G	Ant., RF, Mixer Grid & Osc. Coils	0Ω		1068-25844-8				Channel 8

FIRESTONE MODELS 13-G-191, 13-G-192 (Code 280-5-21T33), 13-G-193, 13-G-194 (Code 280-5-21T31)

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
H	Ant., RF, Mixer Grid & Osc. Coils	0Ω		106S-25844-9				Channel 9
I	Ant., RF, Mixer Grid & Osc. Coils	0Ω		106S-25844-10				Channel 10
J	Ant., RF, Mixer Grid & Osc. Coils	0Ω		106S-25844-11				Channel 11
K	Ant., RF, Mixer Grid & Osc. Coils	0Ω		106S-25844-12				Channel 12
L	Ant., RF, Mixer Grid & Osc. Coils	0Ω		106S-25844-13				Channel 13
L5	Neut. Coil	0Ω		105S-25255				
L6	Fil. Choke	0Ω		106S-25851				
L7	RF Coil	0Ω		106S-25849				
L8	Conv. Plate	.1Ω		106S-25850				
L9	1st. Video IF			13A-24203				Includes 41.25MC trap
L10	2nd. Video IF	.1Ω	.1Ω	13A-24224	17-5004 *	TV-125 *	6234 *	
L11	3rd. Video IF	.1Ω	.1Ω	13A-24937	17-5003 *	TV-128 *	6233 *	Includes 47.25MC trap
L12	Series Peaking Coil	1.8Ω		16A-22427	19-1004		4610	7.5 Microhenries
L13	Series Peaking Coil	5.3Ω		16A-24998	19-3125		6120	140 Microhenries
L14A	4.5MC Trap	1.9Ω		201-23729				
B	1st. Sound IF	3.1Ω						
L15	Series Peaking Coil	6Ω		16A-24020	19-3180	TV-184	6180	170 Microhenries
L16	Shunt Peaking Coil	10.5Ω		16A-24019	19-3500		6138	480 Microhenries
L17	4.5MC Trap	1Ω		16A-25441				
L18	2nd. Sound IF	.4Ω	.4Ω	201-23873	17-3495 *	TV-113 *	6203 *	
L19	Quadrature Coil	5.3Ω		201-23727			1480	
L20	RF Choke	1.7Ω		16A-21701	19-1005		4612	8 Microhenries

* Cut out chassis hole and use adaptor plate.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	NOTES
L21	23Ω	58Ω	12E-24440			6212				Horiz. Osc.
L22	36Ω		13M-24441			6314				Horiz. Phase

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L23	.300A	41Ω	1.5HY	16B-25146	C5037 ①	C2996 ①	C2326 ①	26C44	C-17X ①

① Drill one new mounting hole.

SELENIUM RECTIFIER

ITEM No.	RATING CURRENT	REPLACEMENT DATA FIRESTONE PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.300A	21J25315	1241A	MR350	6S350	6QA2	350A	
M2	.300A	21J25315	1241A	MR350	6S350	6QA2	350A	

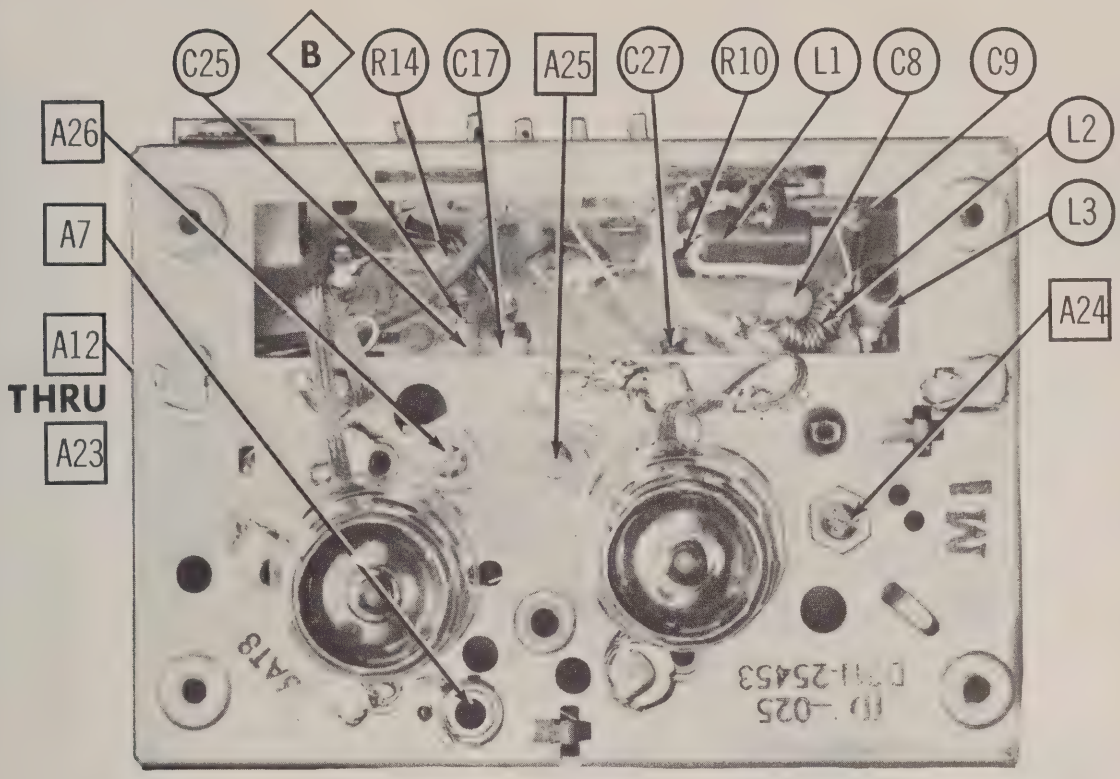
CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA FIRESTONE PART No.	REPLACEMENT DATA SYLVANIA PART No.	NOTES
M3	1N295 *		1N60	Video Det. (Pigtail)

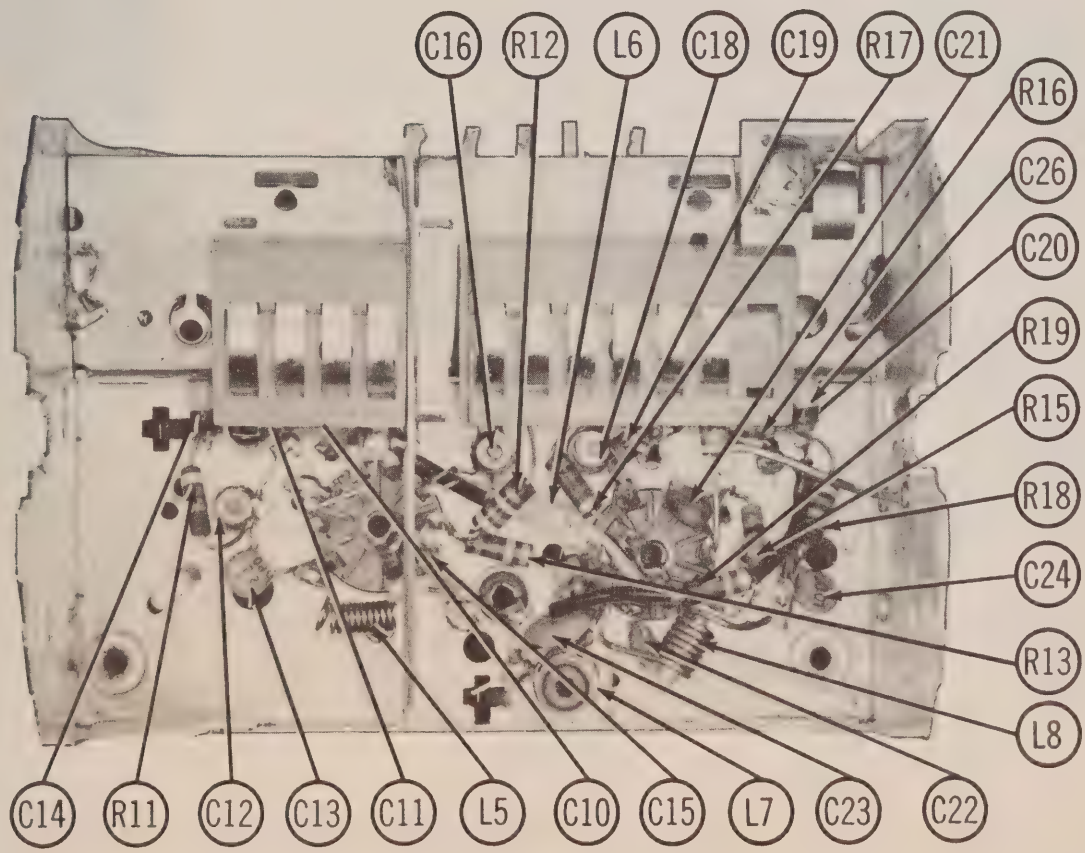
* Some versions may use crystal diode type CK706 in this application.

MISCELLANEOUS

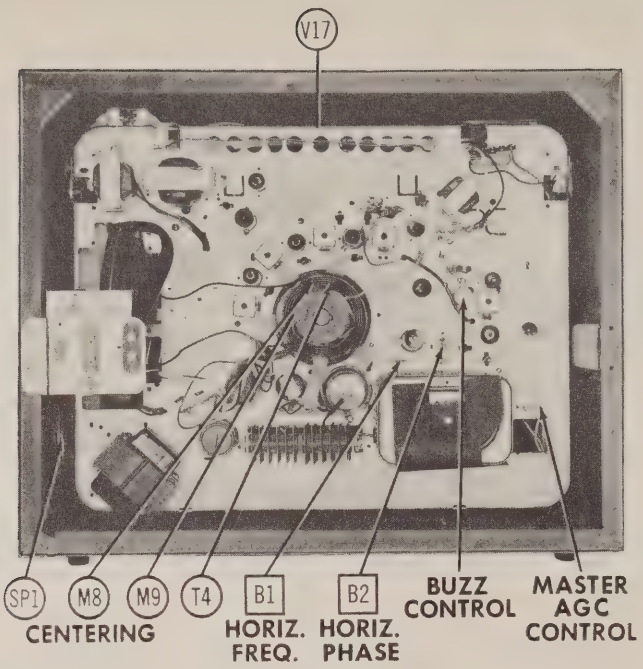
ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M4	Circuit Breaker	20F-25568	Low Voltage Protection
M5	Dial Light	46A-10793	#47
M6	Tuner	211-25453	VHF-Chassis 21T33
	Tuner	211-25475	VHF-UHF Combination-Chassis 21T31
M7	Video Det. Assy.	13B-24206-1	Includes M3, Coils & Capacitors
M8	Centering Device	16M-23770	Includes Deflection Yoke (T4) Rear Cover
M9	Ion Trap	16M-19705	
M10	Correction Magnet	16M-22873	
	Cabinet Assy.	200-25381-1	Models 13-G-192, 13-G-194
	Cabinet Assy.	200-25381	Models 13-G-191, 13-G-193
	Knob	5B-25494-A56	Station Selector-Models 13-G-193, 13-G-194
	Knob	5B-25184-A56	Station sSelector-Models 13-G-191, 13-G-192
	Knob	5B-25734-A56	UHF Indicator-Models 13-G-193, 13-G-194
	Knob	5B-25495-A29	Fine Tuning-Models 13-G-193, 13-G-194
	Knob	5B-25177-A29	Fine Tuning-Models 13-G-191, 13-G-192
	Knob	5B-25183-A56	On-Off-Volume
	Knob	5B-25178-A29	Picture Knob
	Knob	5B-25176-A29	Control (3 used)
	Safety Glass	30M-25492	



RF TUNER-TOP VIEW



RF TUNER-BOTTOM VIEW



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern. Turn the horizontal hold control (R3) to its mid-range position. Connect a short clip lead across L22. Adjust the horizontal frequency slug (B1) until the picture synchronizes horizontally. Remove the clip lead from across L22. Connect the vertical amplifier of the oscilloscope through a low capacity probe to point ⓒ. Low side to chassis.

Adjust the horizontal stabilizer coil slug (B2) until waveform similar to Fig. 7 is obtained. While making this adjustment keep the picture in sync with the horizontal hold control. Remove scope connections. Check range of the horizontal hold control (R3). Turn R3 fully counter clockwise and then fully clockwise. The picture should fall out of sync at each extreme setting of R3.

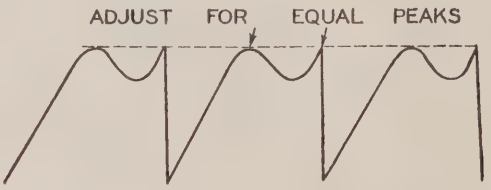
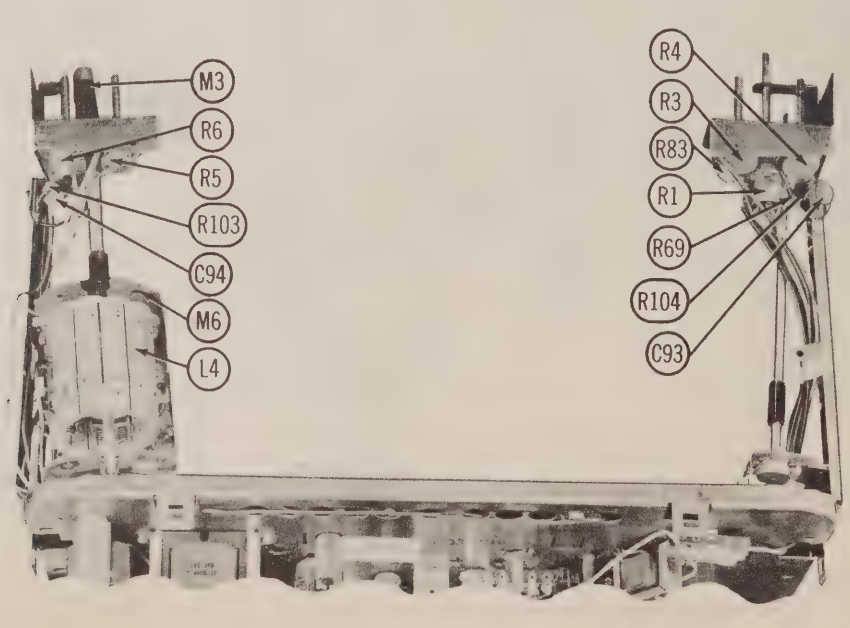
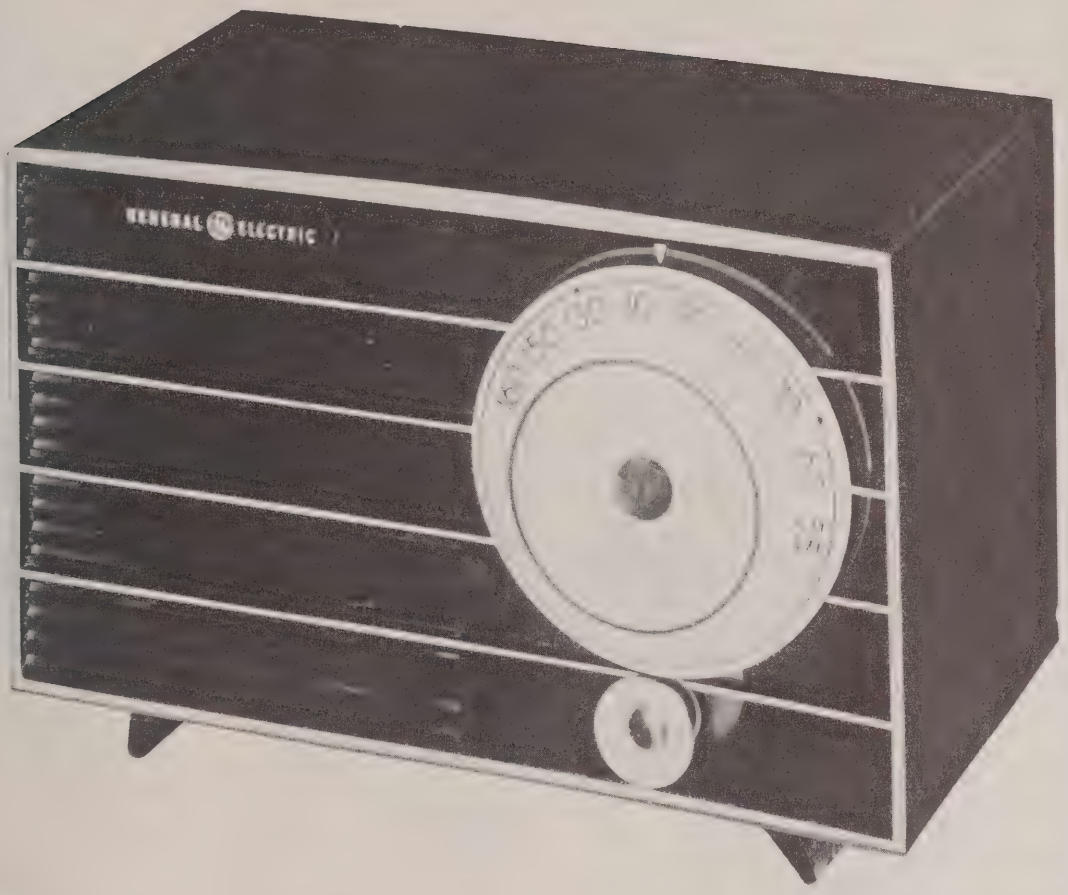


FIG. 7



TUNER & CONTROL ASSEMBLY

GENERAL ELECTRIC
MODELS 455S, 456S, 457S



GENERAL ELECTRIC
MODELS 455S, 456S, 457S

TRADE NAME	General Electric Models 455S, 456S, 457S
MANUFACTURER	General Electric Co., Electronics Dept., Electronics Park, Syracuse, N. Y.
TYPE SET	AC-DC Operated AM Superheterodyne Receiver
TUBES (Five)	Types 12AU6 Converter, 12BA6 IF Amplifier, 12AV6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-120 Volts AC-DC RATING .22 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC - 1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05MFD	High side to pin 1 (grid) of 12AU6 (V1). Low side to B-.	455KC	Tuning gang fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1620KC	"	"	A5	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1500KC	Tune to 1500KC signal.	"	A6	Adjust for maximum output while rocking tuning gang.

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1956 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

PARTS LIST AND DESCRIPTIONS

GENERAL ELECTRIC
Model 455S

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA G. E. PART No.	REPLACEMENT DATA STANDARD REPLACEMENT	NOTES
V1	Converter	12AU6	12AU6	
V2	IF Amplifier	12BA6	12BA6	
V3	Det. -AVC-AF Amplifier	12AV6	12AV6	
V4	Output	50C5	50C5	
V5	Rectifier	35W4	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA G. E. PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	50	150	RCE-207	E58A175				CADP-513	R2211*
B	30	150							

* Unit must be ordered from mfgr.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA G. E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	22		RCW-3196	NPO-S122	TCZ-22	TZ14	NPOK-220	ZT-542	5TCC-Q22	
C3	22		RCW-3196	NPO-S122	TCZ-22	TZ14	NPOK-220	ZT-542	5TCC-Q22	
C4	.05	200	RCC-086	BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C5A	400		♦RCW-3207							
B	2000									
C	220									
D	5000									
C6	10000		RCW-3186	BPD-01	DD-103	K082	811-01	DC511	5HK-S1	
C7	.047	600	RCN-053	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	

♦ Items C5A, C5B, C5C, C5D, R4A, R4B and R4C are combined in one unit.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA G. E. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	RRC-310	AB-60	A47-500K-Z	Q13-133	U-48	Volume
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	KB-1	SWE-12	76-1	US-26	Attach to R1A

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA G. E. PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R2	2.2Meg	½	URD-129	BTS-2.2Meg	
R3	2.2Meg	½	URD-129	BTS-2.2Meg	
R4A	6.8Meg		† RCW-3207	BTS-6.8Meg	
B	470KΩ			BTS-470K	
C	470KΩ			BTS-470K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA G. E. PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R5	180Ω	½	URD-031	BTS-180	
R6	1500Ω	2	URF-053	BTB-1500	

† Items R4A, R4B, R4C, C5A, C5B, C5C, C5D are combined in one unit.

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA G. E. PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.7KΩ	3-4Ω	RTO-176				26S58 ①		① Use Original Channel.

SPEAKER

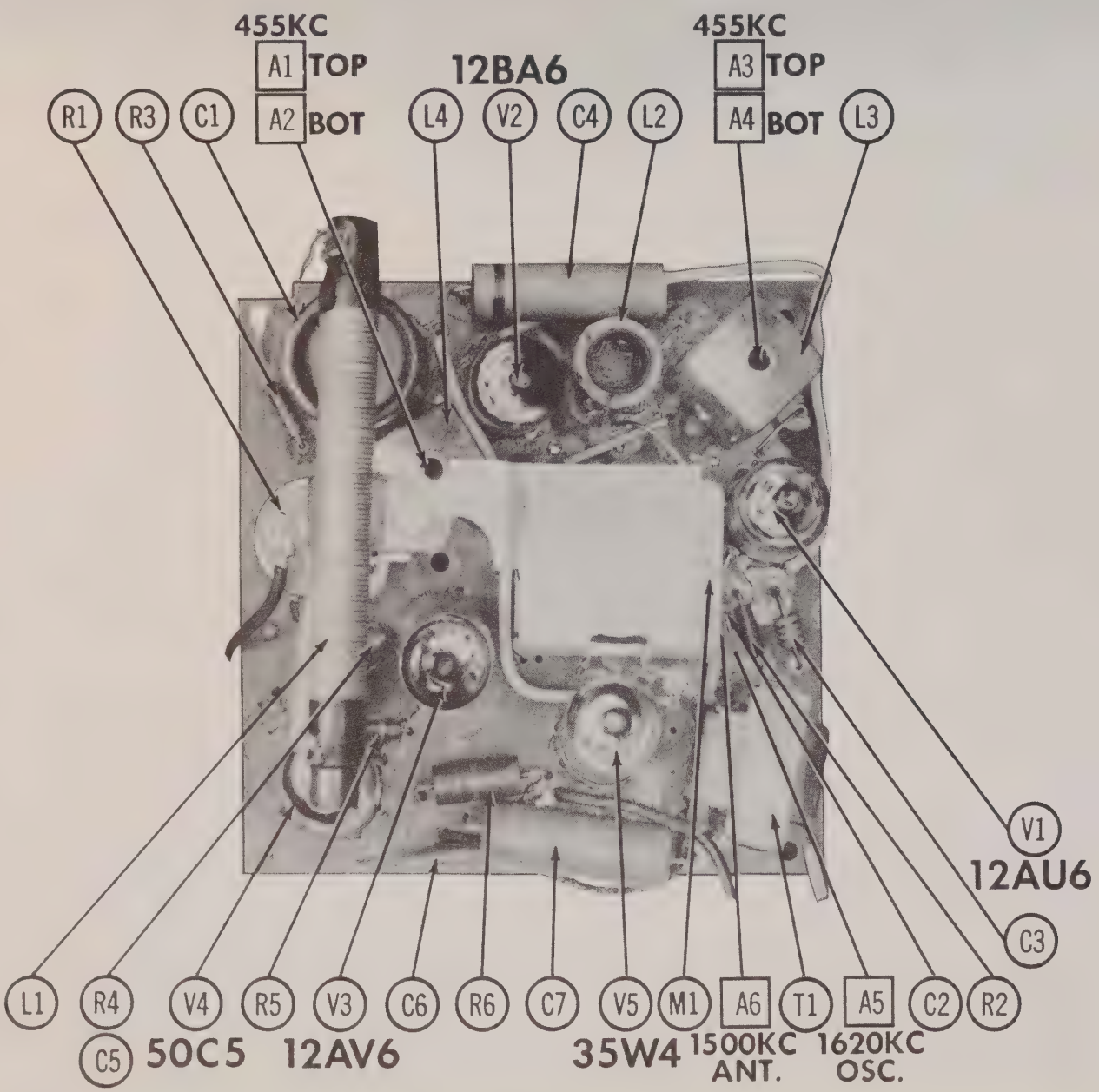
ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA G. E. PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	4"	PM	3-4Ω	S-400D-7	4A07	223S1	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA G. E. PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Loop Stick	.3Ω		RLL-064				
L2	Osc. Coil	1.5Ω	8Ω	RLC-135				Tertiary Windings - 1.8Ω.
L3	Input IF	25Ω	25Ω	RTL-183				
L4	Output IF	25Ω	25Ω	RTL-183				

MISCELLANEOUS

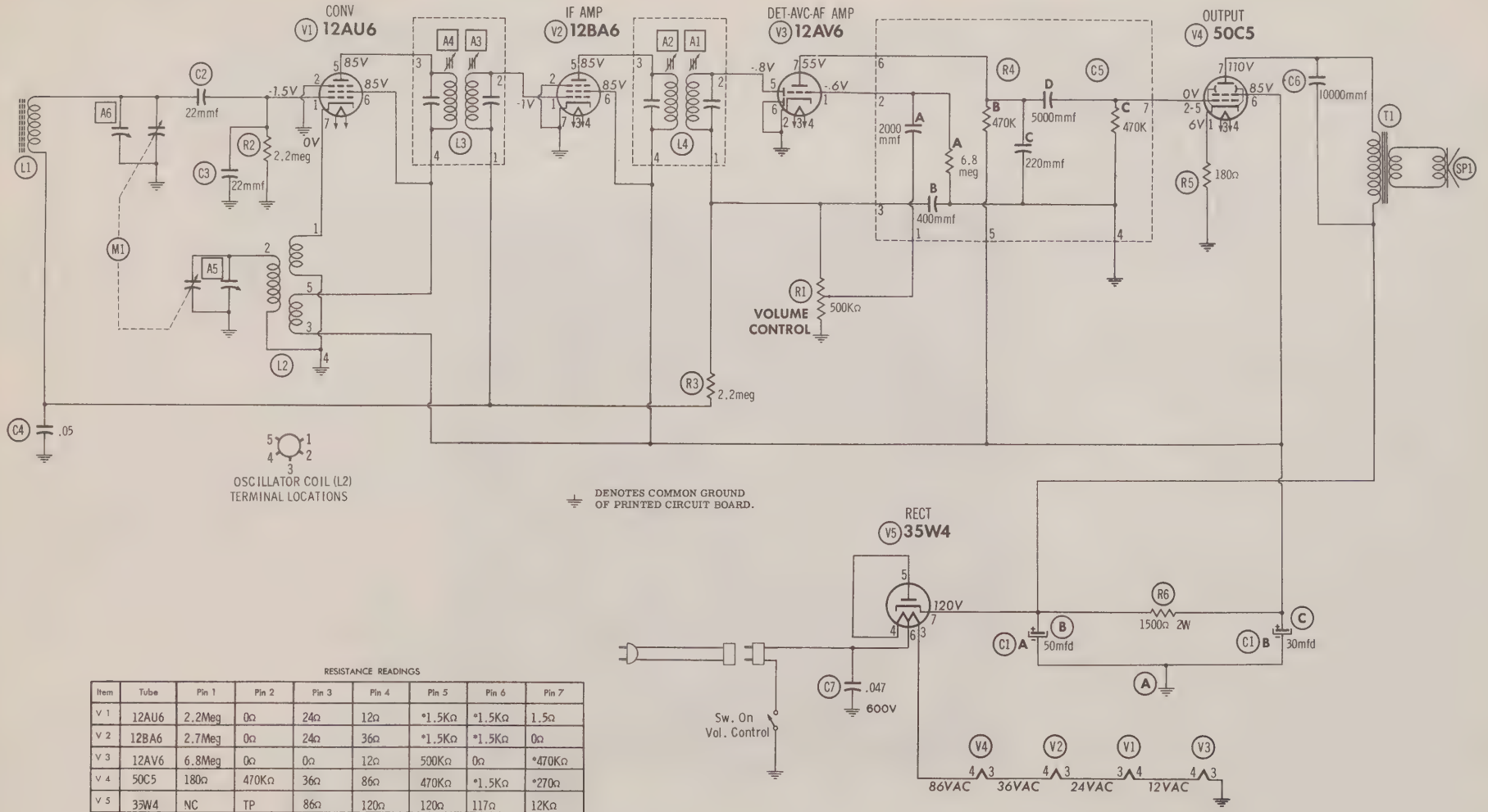
ITEM No.	PART NAME	G. E. PART No.	NOTES
M1	Tuning Cap.	RCT-093	2 Gang (15-290MMF, 19-125MMF.)
	Cabinet	RAU-444	Model 456S
	Cabinet	RAU-445	Model 457S
	Cabinet	RAU-449	Model 455S
	Knob	RDK-357	On-Off-Volume - Model 456S
	Knob	RDK-466	On-Off-Volume - Model 455S
	Knob	RDK-506	On-Off-Volume - Model 457S
	Knob	RDK-465	Tuning - Model 455S
	Knob	RDK-504	Tuning - Model 456S
	Knob	RDK-505	Tuning - Model 457S



CHASSIS-TOP VIEW

GENERAL ELECTRIC
Model 455S

SET 320 FOLDER 8



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12AU6	2.2Meg	0Ω	24Ω	12Ω	*1.5KΩ	*1.5KΩ	1.5Ω
V 2	12BA6	2.7Meg	0Ω	24Ω	36Ω	*1.5KΩ	*1.5KΩ	0Ω
V 3	12AV6	6.8Meg	0Ω	0Ω	12Ω	500KΩ	0Ω	*470KΩ
V 4	50C5	180Ω	470KΩ	36Ω	86Ω	470KΩ	*1.5KΩ	*270Ω
V 5	35W4	NC	TP	86Ω	120Ω	120Ω	117Ω	12KΩ

* MEASURED FROM PIN 7 OF V5.
TP- TIE POINT
NC - NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

IF=455KC

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A PHOTOFACT STANDARD NOTATION SCHEMATIC

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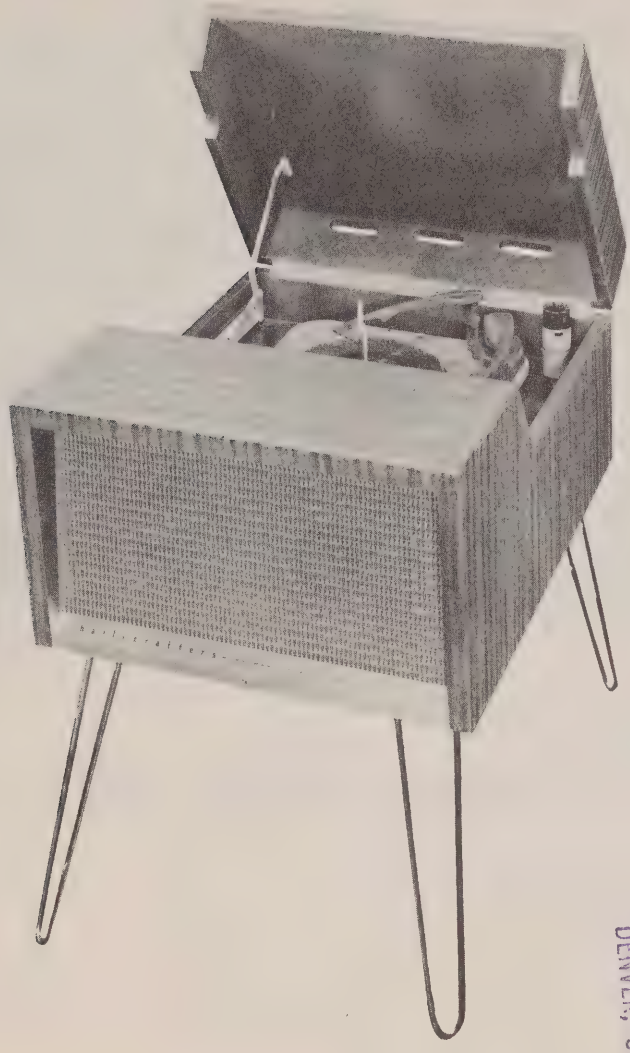
HALLICRAFTERS MODELS
6HFP-1, -2, 8HFP-1, -2 (Run 1)



HALLICRAFTERS MODELS
6HFP-1, -2, 8HFP-1, -2 (Run 1)

PROP. PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

TRADE NAME	Hallicrafters Models 6HFP-1, 6HFP-2, 8HFP-1, 8HFP-2 (Run 1)
MANUFACTURER	Hallicrafters Co., 4401 W. 5th Ave., Chicago 24, Ill.
TYPE SET	AC Operated Phono Amplifier with 3 Speed Automatic Record Changer
TUBES (Six)	Types 6AT6 (or) 6AV6 1st AF Amp., 12AX7 2nd-3rd AF Amp., 6SN7GT 4th AF Amp.-Phase Inv., (2) 6W6GT Output, 5Y3GT Rectifier
POWER SUPPLY	105-120 Volts AC-60 Cycles RATING .68 Amp. @ 117 Volts AC

RECORD CHANGER UNIT PART NO. 115-149--SIMILAR TO WEBCOR MODEL 140-9.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

HALLICRAFTERS
Model 6HFP-1

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA		NOTES
		Hallicrafters PART No.	STANDARD REPLACEMENT	
V1	1st AF Amplifier	6AT6	6AT6	6AV6 may be used as an alternate.
V2	2nd AF Amplifier-			
	3rd AF Amplifier	12AX7	12AX7	
V3	4th AF Amplifier-Phase			
	Inverter	6SN7GT	6SN7GT	
V4	Output	6W6GT	6W6GT	
V5	Output	6W6GT	6W6GT	
V6	Rectifier	5Y3GT	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Hallicrafters PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	250	45B253	AFH4-18-45	C035	FP420. 38	TM-Q40-450	Q-012	TVL-3787
B	▲ 40	250			BR4025				TVA-1511
C	▬ 40	250							
D	■ 40	250							
C2A	■ 40	250	45B252		B058	FP137	TM-2004	S-140	TVL-2505
B	▲.25	25			BR252	TCD26	TD-25-25	MTD-0220	TVA-1205
C	25	25							
C3	50	25	45A254	PRS25V50	BR502	TC29	TD-50-25	FM-0250	TVA-1206

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	Hallicrafters PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	. 0015	600	46BR152L4	SI1500	D6-152	CUB6D15	GP2L-152	UC-5215	6TM-D15	
C5	. 0039	600	46BR392E6	SI4000	D6-402	CUB6D4	GP2-333-402	PT624	6TM-D4	
C6	. 022	400	46BR223L4	BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C7	. 022	400	46BR223L4	BPD-02	DF-203	CUB4S22	817-02	PT4122	4TM-S22	
C8	. 0015	400	46BR152L4	SI1500	D6-152	CUB6D15	GP2L-152	UC-5215	6TM-D15	
C9	. 0018	400	46BR182E4	SI1800	D6-182	TP54	GP2-333-182	UC-5218	5GA-D18	
C10	. 033	400	46BR333L4	BPD-03	DF-303	CUB6S33		PT6133	6TM-S33	
C11	330		47X32SL331K	SI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	
C12	. 0056	400	46BR562E4	SI5600	D6-562	TP65	GP3-333-562			
C13	. 056	400	46BR563E4							
C14	. 0033	400	46BR332L4	SI3300	D6-332	CUB6D33	GP2-333-332	PT6233	6TM-D33	
C15	. 047	400	46BR473L4	BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C16A	200		♦							
B	4500									
C	100									
D	4500									
C17	220		47X32SL221K	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C18	. 022	400	46BR223L4	BPD-02	DD-203	CUB4S22	817-02	PT4122	4TM-S22	
C19	. 022	400	46BR223L4	BPD-02	DD-203	CUB4S22	817-02	PT4122	4TM-S22	
C20	. 5	100	46A177	P185-5		CUB2P5		PT405	2TM-P5	
C21	. 01	600	46BR103L6	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	

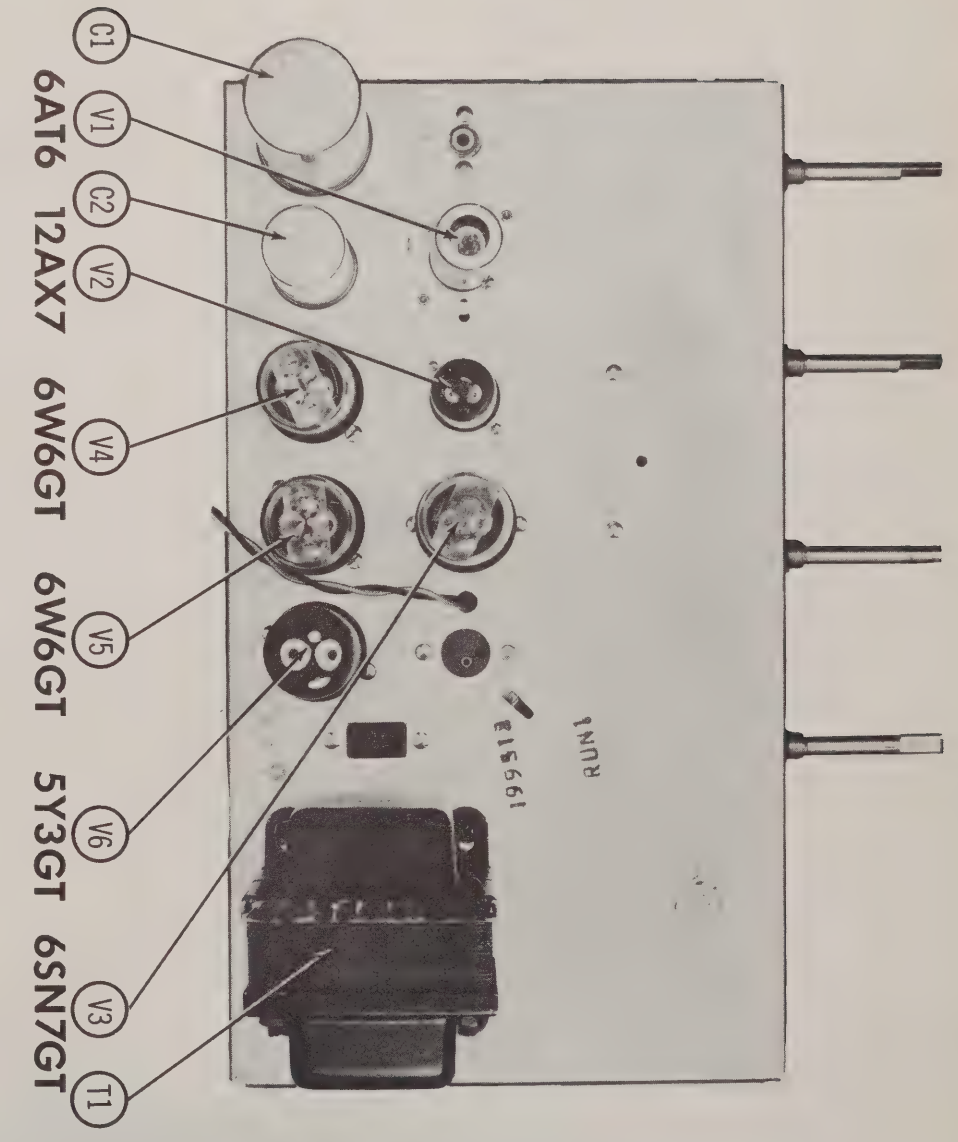
♦ Items C16A, C16B, C16C, C16D, R24A, and R24B are combined in one unit. Unit is part of loudness control assembly Part No. 25B1085.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Hallicrafters PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	500KΩ	½	25B1085 ♦	C1-60-S ♦				Loudness & Switch Taps at 200KΩ and 350KΩ.
R2A	500KΩ	½	25B1084	B-59	A47-500K-S	Q11-133	U-50	Bass
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A.
R3A	500KΩ	½	25B1084	AB-617	A47-500K-S	Q11-133	U-50	Treble
B	Shaft		Not Req.	AK-3	FS-3	Not Req.	Not Req.	Attach to R3A.
R4	60Ω	1	25A1089	VK-117				Hum Balance (Wire Wound)

♦ Control assembly includes R24A, R24B, C16A, C16B, C16C, and C16D.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA Hallicrafters PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R5	3900Ω	½	23X20X392K	BTS-3900	
R6	6800Ω	½	23X20X682K	BTS-6800	
R7	27KΩ	½	23X20X273K	BTS-27K	
R8	15KΩ	½	23X20X153K	BTS-15K	
R9	100KΩ	½	23X20X104K	BTS-100K	
R10	10Meg	½	23X20X106K	BTS-10Meg	
R11	100KΩ 5%	1	23X30X104J	BTA-100K 5%	
R12	150KΩ 5%	1	23X30X154J	BTA-150K 5%	
R13	150KΩ 5%	½	23X20X154J	BTS-150K 5%	
R14	2.2Meg	½	23X20X225K	BTS-2.2Meg	
R15	1Meg	½	23X20X105K	BTS-1Meg	
R16	100KΩ	½	23X20X104K	BTS-100K	
R17	3900Ω	½	23X20X392K	BTS-3900	
R18	10KΩ	½	23X20X103K	BTS-10K	
R19	47KΩ	½	23X20X473K	BTS-47K	
R20	4700Ω	½	23X20X472K	BTS-4700	
R21	47KΩ	½	23X20X473K	BTS-47K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA Hallicrafters PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R22	100KΩ	½	23X20X104K	BTS-100K	
R23	3900Ω	½	23X20X392K	BTS-3900	
R24A	50KΩ		♦	BTS-47K	
B	50KΩ			BTS-47K	
R25	3900Ω 5%	½	23X20X392J	BTS-3900 5%	
R26	220KΩ	½	23X20X224K	BTS-220K	
R27	47KΩ	½	23X20X473K	BTS-47K	
R28	47KΩ	½	23X20X473K	BTS-47K	
R29	4700Ω	½	23X20X472K	BTS-4700	
R30	470KΩ	½	23X20X474K	BTS-470K	
R31	470KΩ	½	23X20X474K	BTS-470K	
R32	100Ω	2	23X40X101K		
R33	27KΩ 5%	1	23X20X273J	BTS-27K 5%	
R34	100Ω	2	23X40X101K		
R35	2200Ω	1	23X30X222K	BTA-2200	
R36	33KΩ	2	23X40X333K	BTB-33K	

♦ Items R24A, R24B, C16A, C16B, C16C, and C16D are combined in one unit. Unit is part of loudness control assembly Part No. 25B1085.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA Hallicrafters PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC ⓐ .68A	420VCT ⓐ .117ADC	5VAC ⓐ 2A	6.3VAC ⓐ 4A	52D314					

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA Hallicrafters PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	2.5KΩ	8Ω	52C244	Z1104 ①		A-3830	22S62		① Drill one new mtg. hole.

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA Hallicrafters PART No.	REPLACEMENT DATA QUAM PART No.	REPLACEMENT DATA RCA TYPE No.	NOTES
SP1	3"	PM	16Ω	85C183			① Used in Models 6HFP-1 and 6HFP-2.
SP2	8"	PM	8Ω	85C182	8A10X		
	3"	PM	16Ω	85C170 ①			
	8"	PM	8Ω	85C168 ①	8A10X		

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA Hallicrafters PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLE	REMARKS
M1	21-165					

PHONO NEEDLE

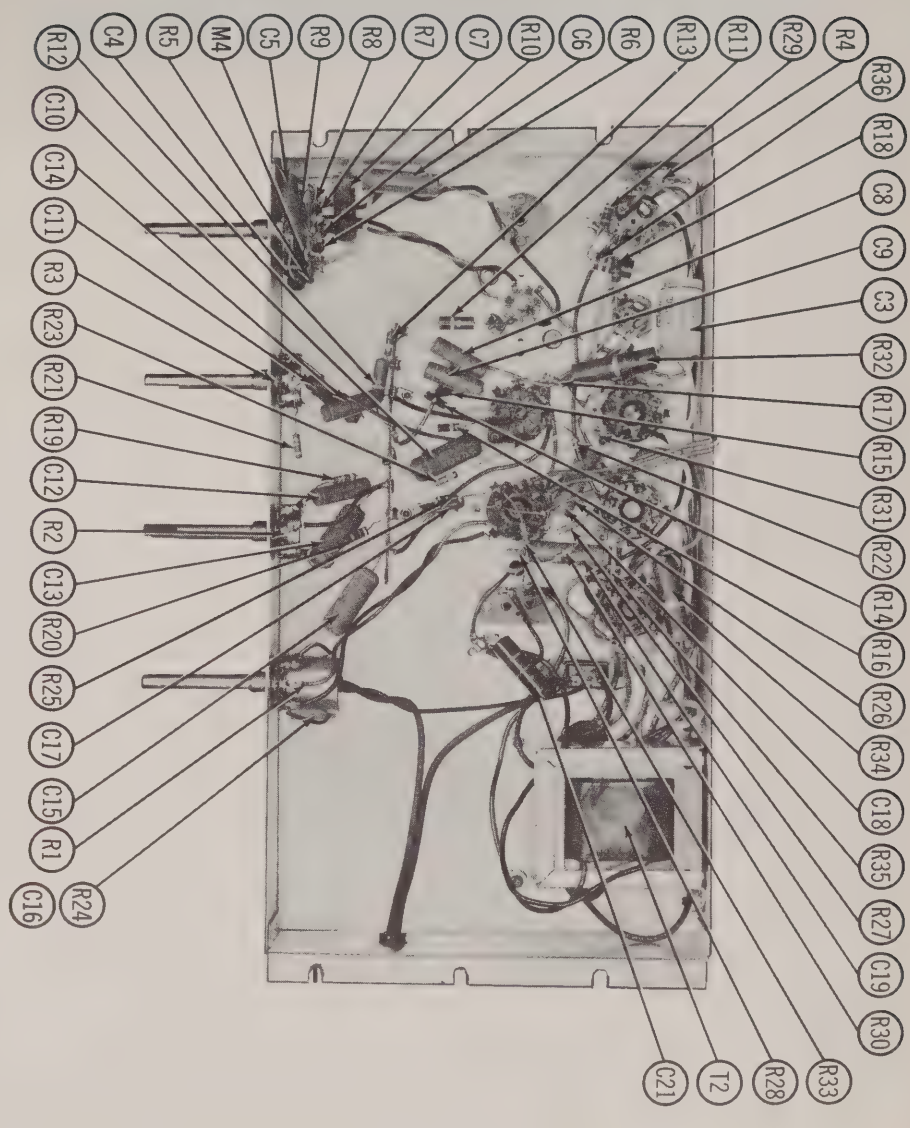
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA Hallicrafters PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M2	121A104	† GE-11 or ♦†G-11SD or ♦ G-11D	† AC-410 or ♦†AC-410D1 or †♦ AC-410D2 or ♦ AC-410D	† W-66TPS or ♦†W-66DS or ♦ W-66TPD	† Jewel ♦ Diamond

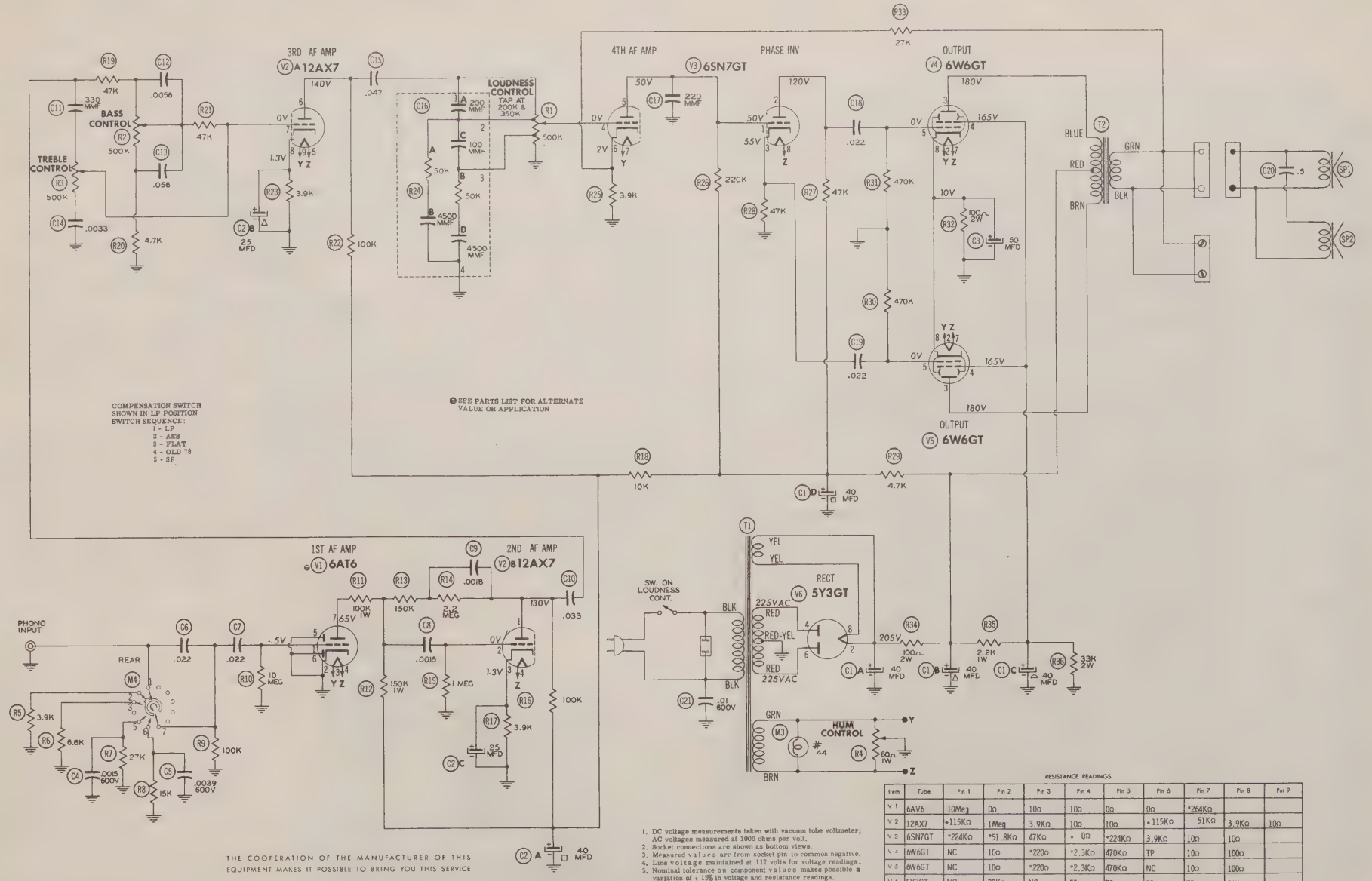
MISCELLANEOUS

ITEM No.	PART NAME	Hallicrafters PART No.	NOTES
M3	Pilot Light	39A003	#44
M4	Switch	60C606	Record Compensator (SP-5 Position-Rotary, Wafer Type)
	Cabinet	78F1107	Blonde-Models 6HFP-1, -2
	Cabinet	78F1199	Blonde-Models 8HFP-1, -2

CHASSIS—BOTTOM VIEW



HALLICRAFTERS Model 6HFP-1



THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AV6	10Meg	0Ω	10Ω	10Ω	0Ω	0Ω	*264KΩ		
V 2	12AX7	*115KΩ	1Meg	3.9KΩ	10Ω	10Ω	*115KΩ	51KΩ	3.9KΩ	10Ω
V 3	6SN7GT	*224KΩ	*51.8KΩ	47KΩ	* 0Ω	*224KΩ	3.9KΩ	10Ω	10Ω	
V 4	6W6GT	NC	10Ω	*220Ω	*2.3KΩ	470KΩ	TP	10Ω	100Ω	
V 5	6W6GT	NC	10Ω	*220Ω	*2.3KΩ	470KΩ	NC	10Ω	100Ω	
V 6	5Y3GT	NC	30KΩ	NC	55Ω	TP	55Ω	TP	30KΩ	

MEASURED FROM PIN 2 OF V6.
TP - TIE POINT
NC - NO CONNECTION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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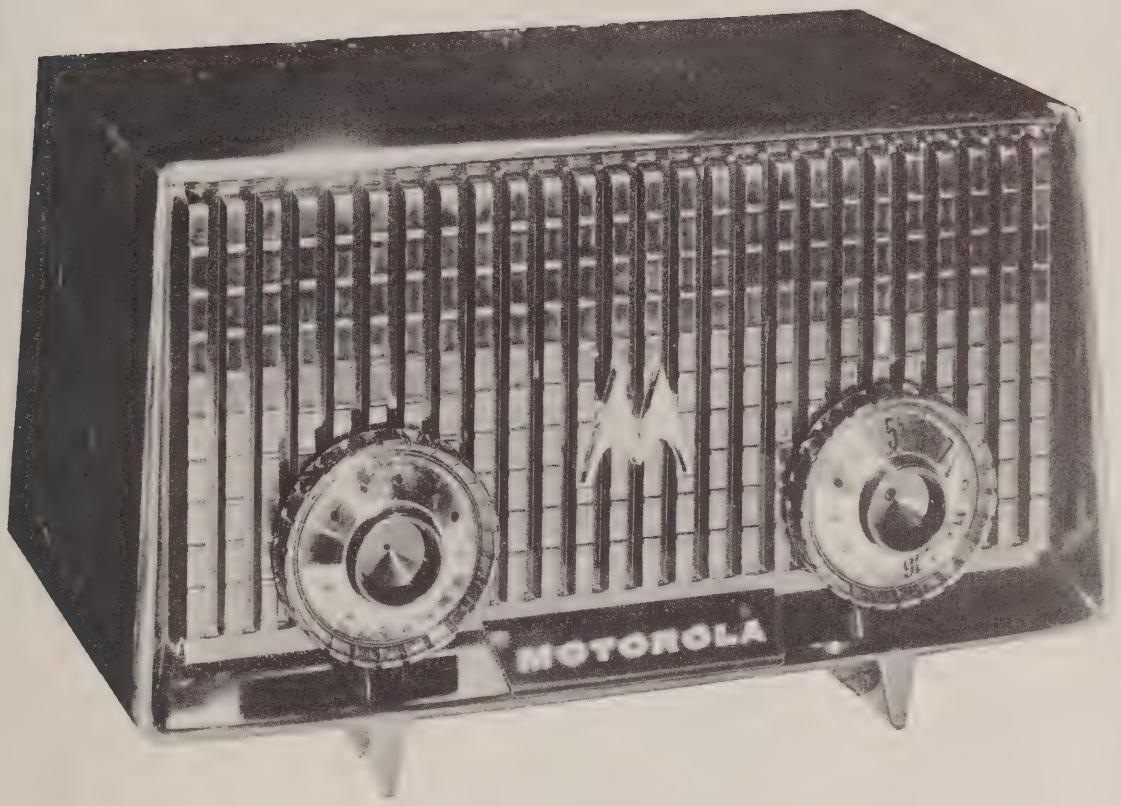
MOTOROLA MODELS
56R1, 2, 3, 4 (Ch. HS-487)



MOTOROLA MODELS
56R1, 2, 3, 4 (Ch. HS-487)

TRADE NAME	Motorola Models 56R1, 56R2, 56R3, 56R4 (Ch. HS-487)
MANUFACTURER	Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Illinois
TYPE SET	AC-DC Operated AM Superheterodyne Receiver
TUBES (Five)	Types 12BE6 Converter, 12BA6 IF Amplifier, 12AV6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-DC — RATING .245 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	535KC—1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to outer chassis edge.	455KC (400~ mod.)	Tuning gang fully open.	Across voice coil.	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	"	"	1620KC	"	"	A5	"

L. F. [illegible] KENSHIP
39[illegible] MONROE ST.
DENVER, COLORADO

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PARTS LIST AND DESCRIPTIONS

MOTOROLA
Model 56R1 (Ch. HS-487)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	NOTES
V1	Converter	12BE6	12BE6	
V2	IF Amplifier	12BA6	12BA6	
V3	Det. -AVC-AF Amplifier	12AV6	12AV6	
V4	Output	50C5	50C5	
V5	Rectifier	35W4	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■50	150	28B632015	AFH2-15	B015	FP213	TMD12	D-065	TVL-2432
B	▲30	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.05	200	5B120842	BPD-05	DF-503			PTS415	2SE-S47	
C3A	220									
B	5000									
C	5000		♦21B630180	♦PA-299						
D	250									
E										
C4	.03	200	5K122226	BPD-03	DF-303				2SE-S33	
C5	.05	400	5K120268	BPD-05	DF-503			PTS415	4S3-S47	

♦ Items C3A, C3B, C3C, C3D, C3E, R6A, R6B and R6C are combined in one unit. When replacing items separately, C3D and C3E should total 250MMF.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	1Meg	½	18B632047					Volume & Switch.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	22KΩ	½	6R5028	BTS-22K	
R3	3.3Meg	½	6R2118	BTS-3.3Meg	
R4	100Ω	½	6R6018	BTS-100	
R5	3.3Meg	½	6R2118	BTS-3.3Meg	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R6A	6.8Meg		♦21B630180	BTS-6.8Meg	
B	470KΩ			BTS-470K	
C	470KΩ			BTS-470K	
R7	150Ω	½	6R3992	BTS-150	
R8	1000Ω	½	6K119404	BTA-1000	
R9	27Ω	½	6R5683	BTS-27	

♦ Items R6A, R6B, R6C, C3A, C3B, C3C, C3D, C3E are combined in one unit.

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.4KΩ	3-4Ω	25B632025-E	Z1101 ①	A-3025 ①	A3332 ①	26S58 ①	S-12X ①	① Use Original Channel.

SPEAKER

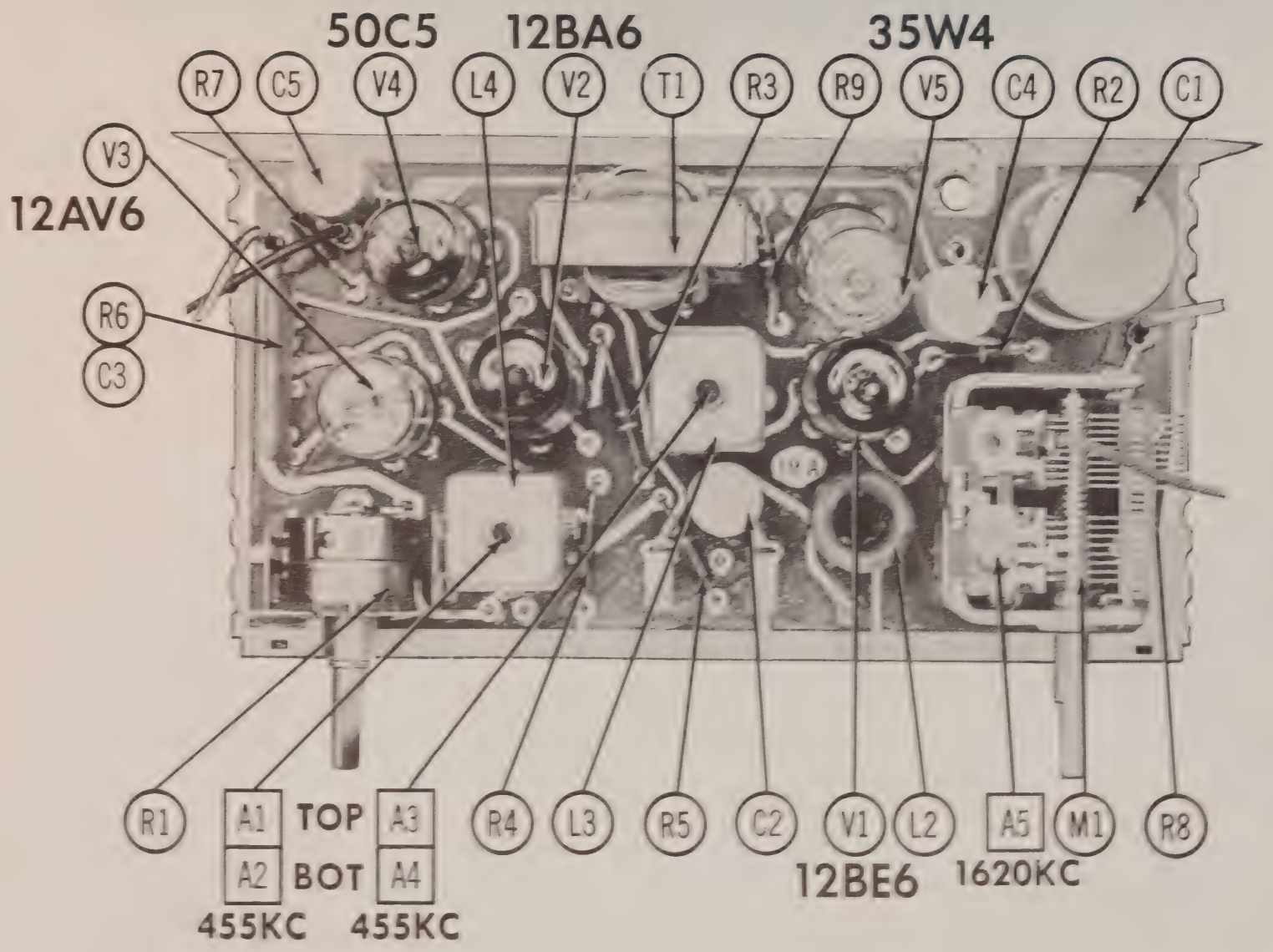
ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: MOTOROLA PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	4"	PM	3-4Ω	50C633560	4A07 ①	223S1 ①	① Drill 1/2" Mounting Holes.

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: MOTOROLA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Loop Ant.	3.8Ω		1V633639				Includes cabinet back.
L2	Osc. Coil	.9Ω	12Ω	24B631990				
L3	Input IF	15Ω		24K632782				
L4	Output IF	13Ω	13Ω	24K632039				

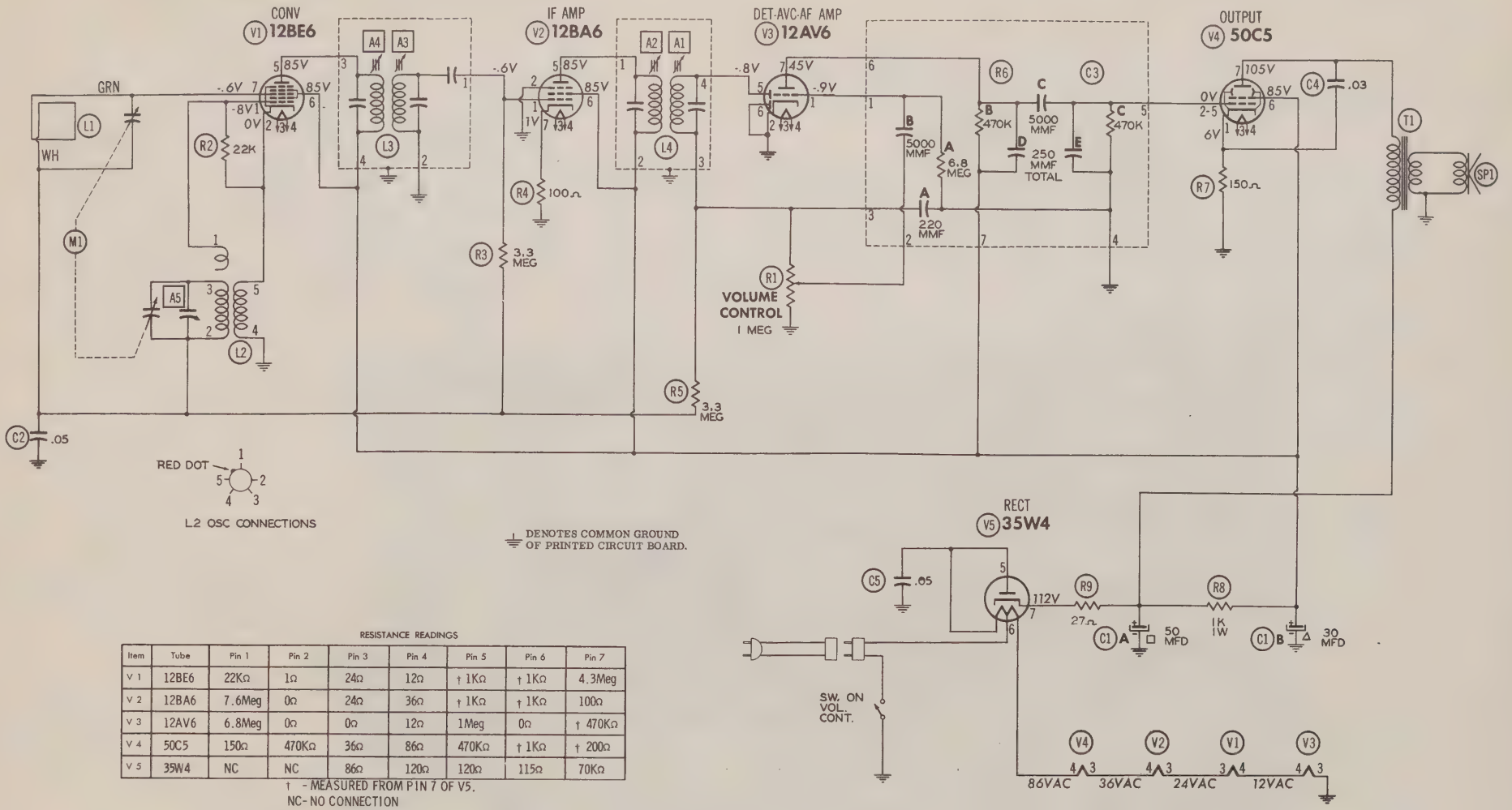
MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M1	Tuning Cap.	19B632026	2 Gang
	Cabinet	1V633184	Model 56R1
	Cabinet	1V633185	Model 56R2
	Cabinet	1V633186	Model 56R3
	Cabinet	1V633187	Model 56R4
	Knob	36C633566	Tuning - Model 56R1
	Knob	36K633568	Tuning - Model 56R2
	Knob	36K633570	Tuning - Model 56R3
	Knob	36K633572	Tuning - Model 56R4
	Knob	36K633576	On-Off-Volume - Model 56R1
	Knob	36K633578	On-Off-Volume - Model 56R2
	Knob	36K633580	On-Off-Volume - Model 56R3
	Knob	36K633582	On-Off-Volume - Model 56R4



CHASSIS-TOP VIEW

MOTOROLA
Model 56R1 (Ch. HS-487)



RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	1Ω	24Ω	12Ω	† 1KΩ	† 1KΩ	4.3Meg
V 2	12BA6	7.6Meg	0Ω	24Ω	36Ω	† 1KΩ	† 1KΩ	100Ω
V 3	12AV6	6.8Meg	0Ω	0Ω	12Ω	1Meg	0Ω	† 470KΩ
V 4	50C5	150Ω	470KΩ	36Ω	86Ω	470KΩ	† 1KΩ	† 200Ω
V 5	35W4	NC	NC	86Ω	120Ω	120Ω	115Ω	70KΩ

† - MEASURED FROM PIN 7 OF V5.
NC- NO CONNECTION

1. DC voltage measurements taken with vacuum tube voltmeter;. AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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RCA VICTOR
MODEL 6-HF-4 (Ch. RS-146C)

RCA VICTOR
MODEL 6-HF-4 (Ch. RS-146C)

TRADE NAME	RCA Victor Model 6-HF-4 (Ch. RS-146C)
MANUFACTURER	RCA Victor Radio & "Victrola" Div., Radio Corp. of America, Camden 2, N.Y.
TYPE SET	AC Operated Phono Amplifier With 3 Speed Automatic Record Changer
TUBES (Four)	Types 6C4 1st. AF Amplifier, 12AX7 2nd. AF Amplifier-Phase Inv., (2) 50C5 Output
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING .35 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE RCA VICTOR MODEL RP-198 - PHOTOFACT SET #273-FOLDER 9.

PROPERTY OF
L. F. D. [illegible]
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PARTS LIST AND DESCRIPTIONS

RCA VICTOR
Model 6-HF-4 (Ch. RS-146C)

PARTS LIST AND DESCRIPTIONS (Continued)

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	NOTES
V1	1st. AF Amplifier	6C4	6C4	
V2	2nd. AF Amplifier-Phase Inverter	12AX7	12AX7	
V3	Output	50C5	50C5	
V4	Output	50C5	50C5	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	RCA Victor PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	80	150	78617	PRS150V8040-20	BBRT84215	TCT3117	TDL-804020-150	D-085	TVA-3455
B	30	150						MT-1512	
C	10	150							
C2	50	6	78573	PRS25V50	BBR50-6	TC29	TD-50-6	MMT-650	TVA-1100
C3	8	10VAC	100509					MMT-0220 *	
								MMT-0220 *	

* Connect negative leads together.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	RCA Victor PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	.047	400	73553							
C5	1800		74850	1464-0018		1R5D18	811-182		MS-218	
C6	.01	200	101000							
C7	.001	600	75643	1464-001		1R5D1	811-102	MCB255	MS-21	
C8	.01	400	73561							
C9	.047	400	73553							
C10	.0015	600	76508	1464-0015		1R5D15	811-152	MCB456	MS-215	
C11	.012	200	74938							
C12	.047	200	73558							
C13	.047	400	73553							
C14	.047	400	73553							
C15	.1	400	73551							
C16	.047	400	73553							

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	RCA Victor PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	100936	ABT-59		Q18-133XX	UDT-283	Loudness, taps @ 84KΩ & 168KΩ
B	Shaft		Not Req.	AK-3		Not Req.	Not Req.	Attach to R1A
R2	2Meg	½	100938	B-77		Q17-139		Bass
R3	100KΩ	½	100937					Treble-Note 1

Note 1. Control open @ 100KΩ.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	RCA Victor PART No.	IRC PART No.	NOTES
R4	390KΩ	½	502439	BTS-390K	
R5	1.8Meg	½	502518	BTS-1.8Meg	
R6	4700Ω	½	502247	BTS-4700	
R7	15KΩ	½	502315	BTS-15K	
R8	82KΩ	½	502382	BTS-82K	
R9	3900Ω	½	502239	BTS-3900	
R10	220KΩ	½	502422	BTS-220K	
R11	22KΩ	½	502322	BTS-22K	
R12	8200Ω	½	502282	BTS-8200	
R13	220KΩ	½	502422	BTS-220K	
R14	6800Ω	½	502268	BTS-6800	
R15	220KΩ	½	502422	BTS-220K	

ITEM No.	RATING: OHMS	RATING: WATT	RCA Victor PART No.	IRC PART No.	NOTES
R16	6800Ω	½	502268	BTS-6800	
R17	470KΩ	½	502447	BTS-470K	
R18	39KΩ	½	502339	BTS-39K	
R19	82Ω	1	31959		
R20	470KΩ	½	502447	BTS-470K	
R21	10KΩ	½	502310	BTS-10K	
R22	18KΩ	½	502318	BTS-18K	
R23	1200Ω	1	512212	BTA-1200	
R24	100KΩ	½	502410	BTS-100K	
R25	15Ω	1	38859		
R26	15Ω	1	38859		

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.1	RCA Victor PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	4.8KΩ CT	3.2Ω SEC 2 / 1.24Ω RES.	100940						

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	RCA Victor PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	8"	PM	3.2Ω	78597	8A31	208S2	
SP2	3½"	PM	6.6Ω	100465	3A15TZ6.6		
SP3	3½"	PM	6.6Ω	100465	3A15TZ6.6		

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	RCA Victor PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.100ADC	100654	1005A	RS150	6S150	6P2	150	

PHONO CARTRIDGE

ITEM No.	RCA Victor PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	ELECTRO-VOICE PART No.: CARTRIDGE	ELECTRO-VOICE PART No.: NEEDLE	REMARKS
M2	100653	55-T	GD-J	47	0-1 or S-1 & 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

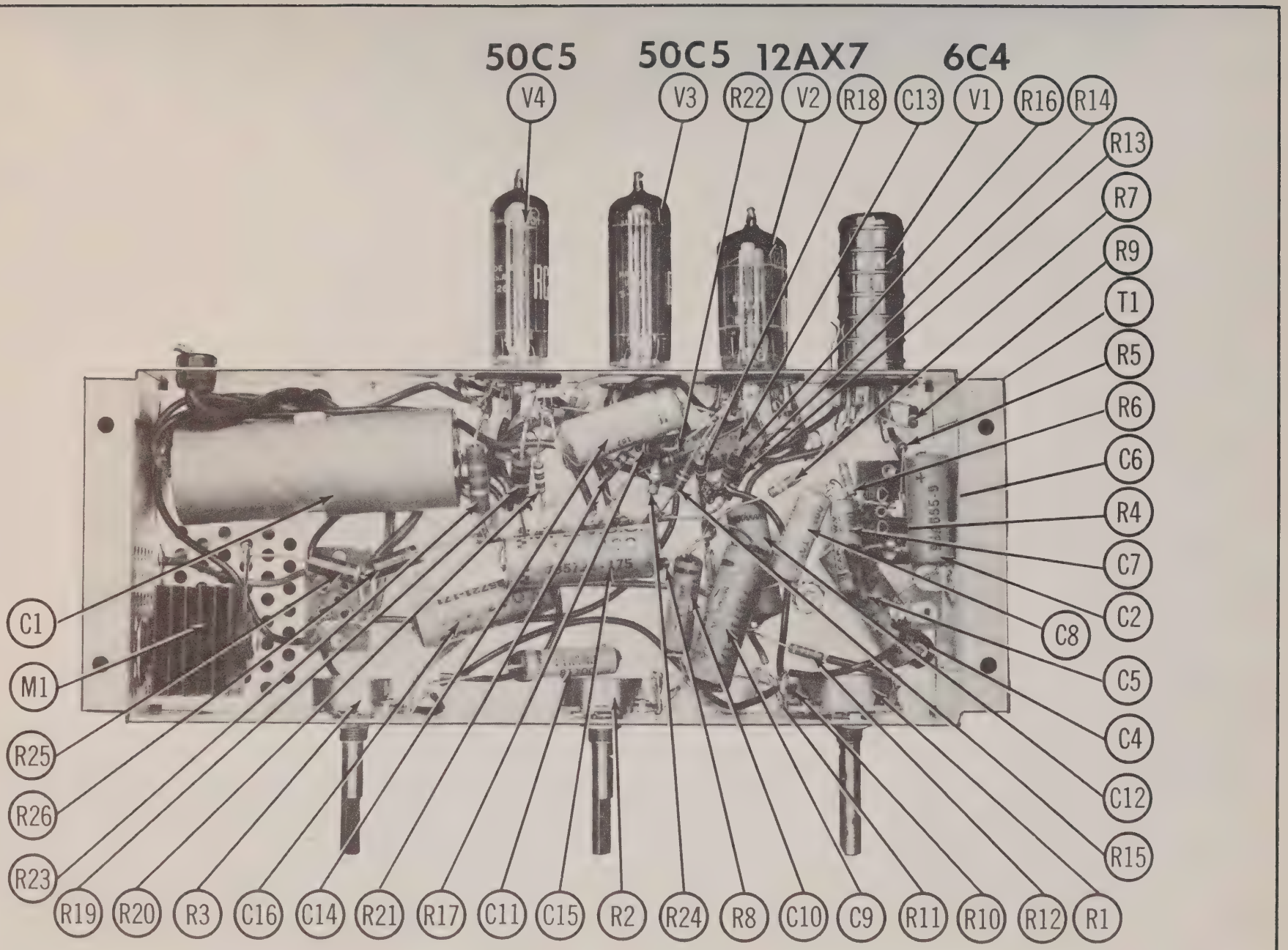
PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	RCA Victor PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M3		*S-67 or †S-66 or ♦†S-66SD or ♦S-66D	†AC-434 or ♦†AC-434D1 or †♦AC-434D2 or ♦AC-434D or †AA-434 or ♦AA-434D	†W-75TPS or ♦†W-75DS or ♦W-75TPD	* Metal † Jewel ♦ Diamond

MISCELLANEOUS

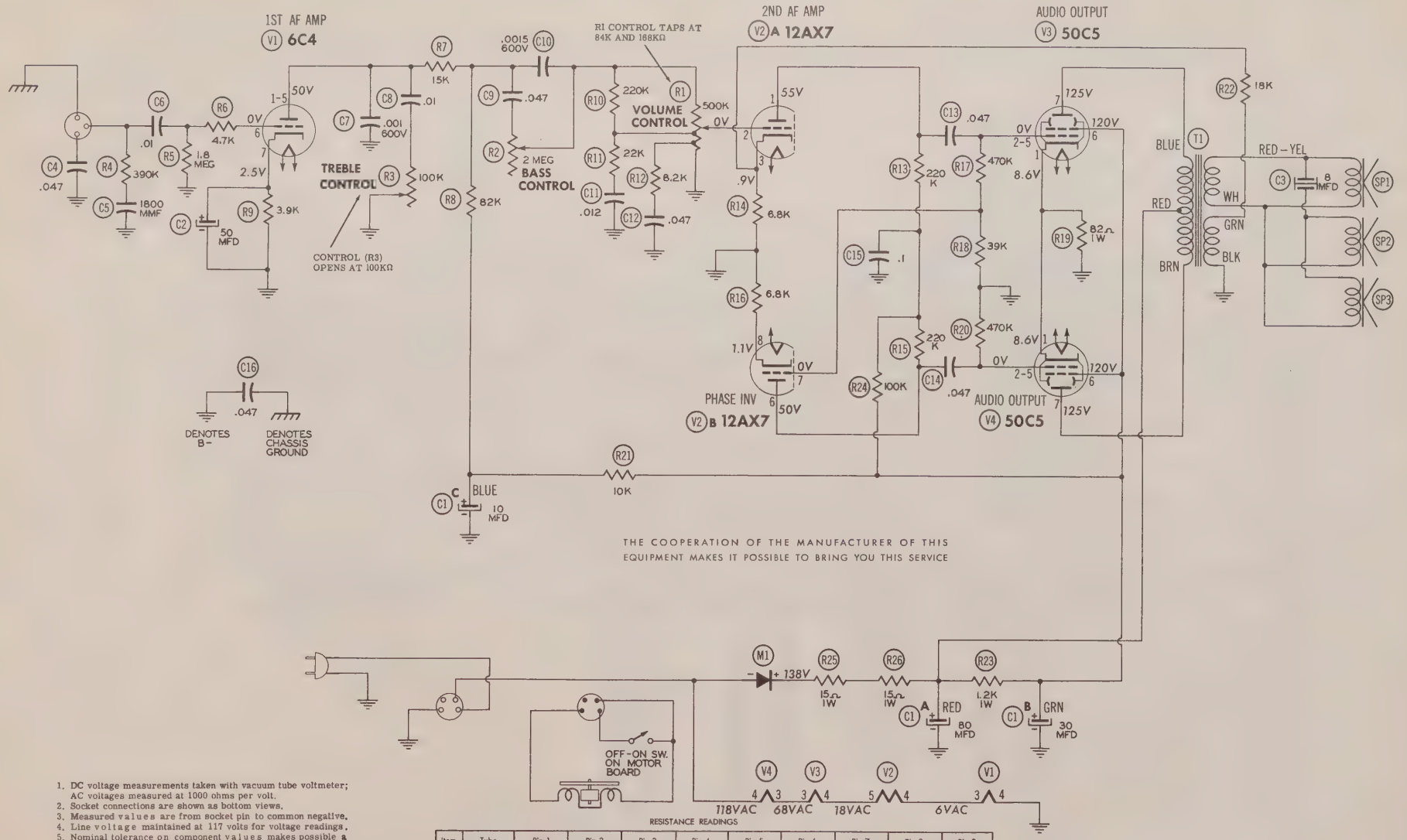
ITEM No.	PART NAME	RCA Victor PART No.	NOTES
	Knob	100941	Control (3 used)



CHASSIS-BOTTOM VIEW

RCA VICTOR
Model 6-HF-4 (Ch. RS-146C)

SET 320 FOLDER II



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6C4	* 108KΩ	TP	6Ω	0Ω	*108KΩ	1.8Meg	3.9KΩ		
V 2	12AX7	*321KΩ	0Ω	6.8KΩ	6Ω	18Ω	*321KΩ	39KΩ	6.8KΩ	12Ω
V 3	50C5	82Ω	509KΩ	68Ω	18Ω	509KΩ	*1.2KΩ	*170Ω		
V 4	50C5	82Ω	470KΩ	68Ω	118Ω	470KΩ	*1.2KΩ	*170Ω		

ALL MEASUREMENTS TAKEN WITH PHONO MOTOR DISCONNECTED.
* MEASURED FROM OUTPUT OF MI.
TP - TIE POINT

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SENTINEL
MODEL 816C

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MODEL 816C

SENTINEL
MODEL 816C

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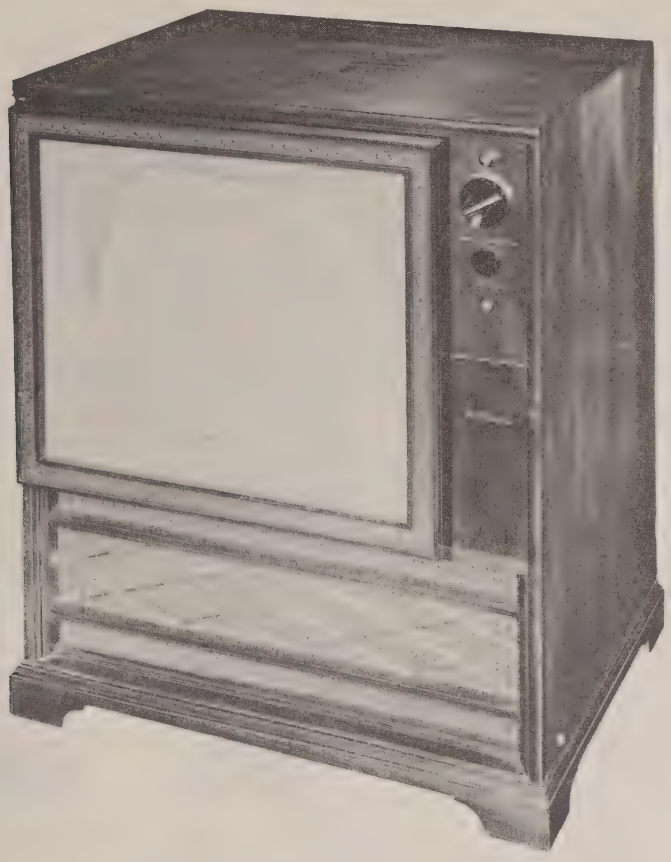
DATE 6–56 SET 320 FOLDER 12

SENTINEL MODEL 816C



PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

SENTINEL MODEL 816C

TRADE NAME	Sentinel Model 816, 816C
MANUFACTURER	Sentinel Radio Corp., 2100 W. Demster St., Evanston, Illinois
TYPE SET	Color Television Receiver
TUBES	Twenty-nine
POWER SUPPLY	110-120 Volts AC-60 Cycles — RATING 3.55 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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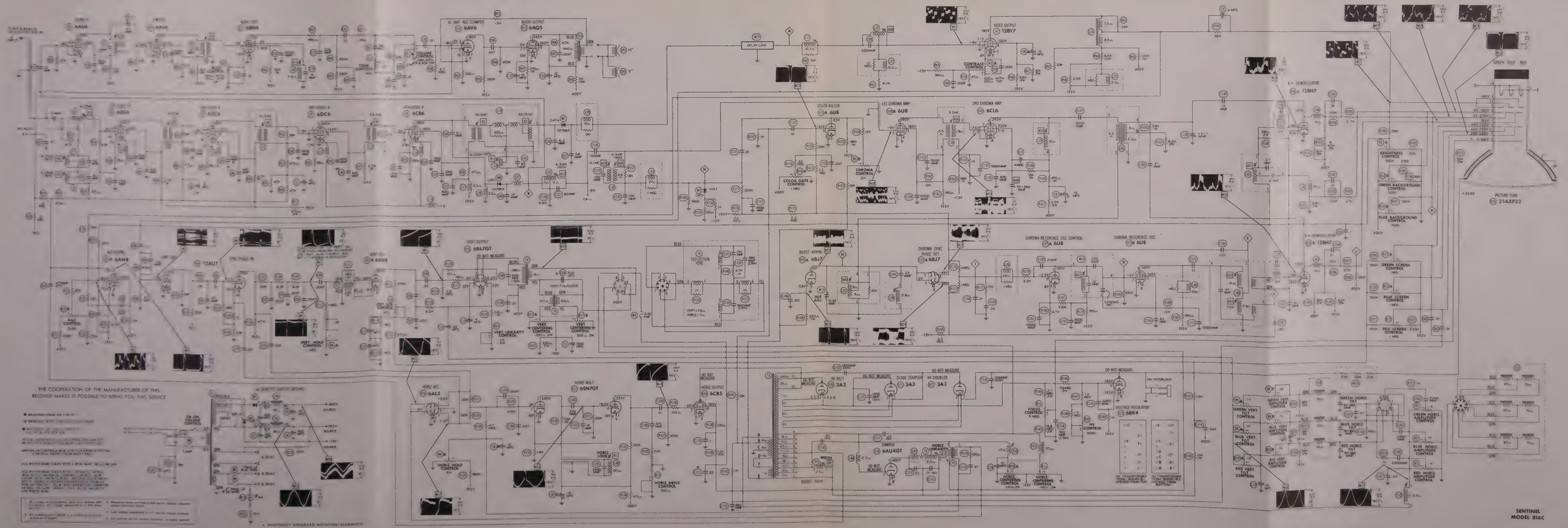
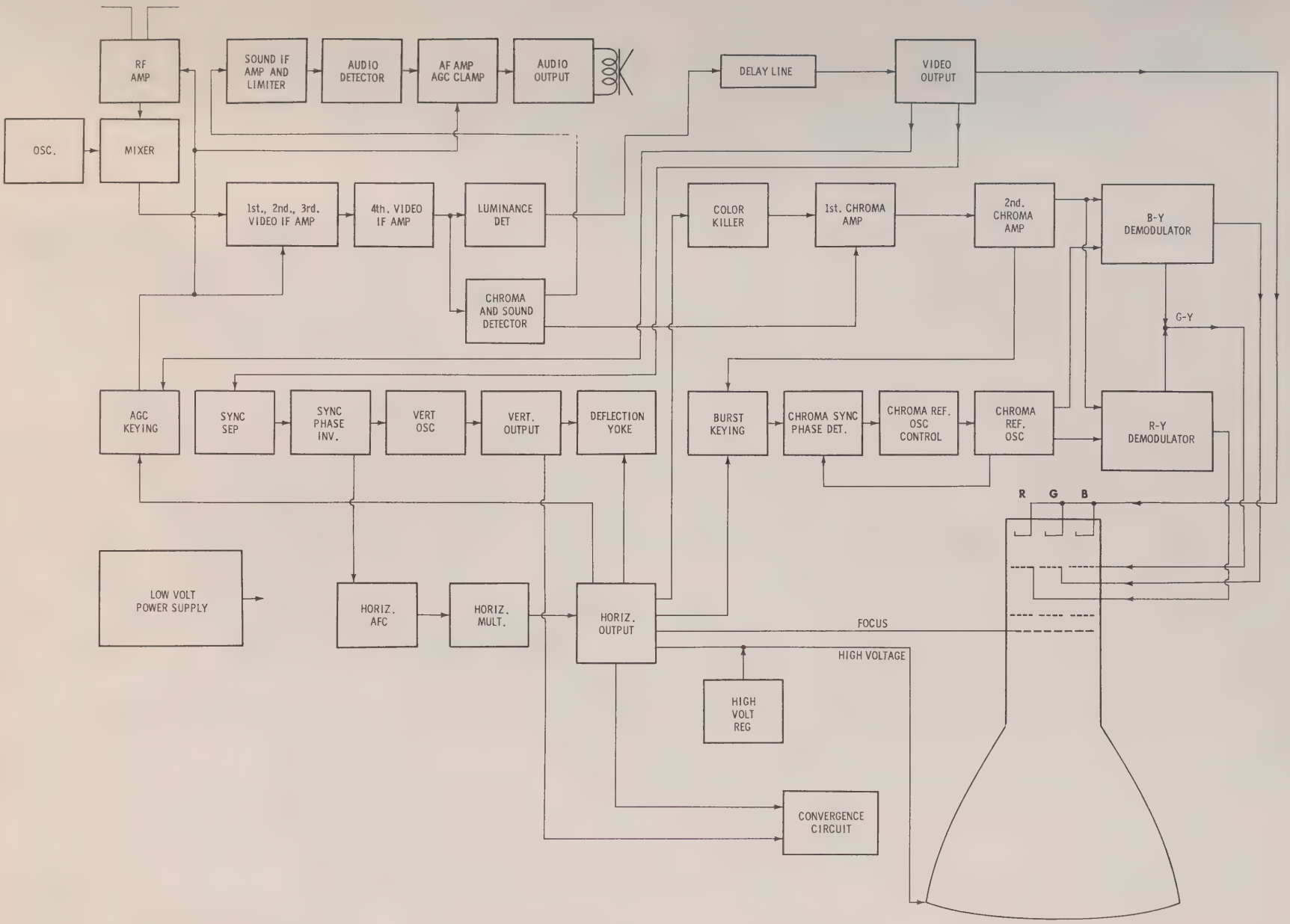
SENTINEL MODEL 816C


THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
SENTINEL MODEL 816C
PICTURE TUBE 21AXP22
DELAY LINE
VIDEO OUTPUT 12BY7
1ST CHROMA AMP 6U8
2ND CHROMA AMP 6CL6
COLOR KILLER 6U8
CHROMA REFERENCE OSC 6U8
R-Y DEMODULATOR 12BH7
B-Y DEMODULATOR 12BH7
BURST KEYING 6BJ7
CHROMA SYNC PHASE DET 6BJ7
VERT OUTPUT 6BL7GT
HORIZ OUTPUT 6BC5
HORIZ MULT 6SN7GT
HORIZ MFC 6AL5
HV RECT 3A2
DIODE COUPLER 3A3
HV DOUBLER 3A3
DAMPER 6AU4GT
HV REGULATOR 6BK4
AV AMP ACC CLAMPER 6AV6
AUDIO OUTPUT 6AQ5
SYNC SEPARATOR 6AN8
SYNC INVERTER 12AU7
R-F AMP 6DC6
1ST VIDEO-I-F 6DC6
2ND VIDEO-I-F 6DC6
3RD VIDEO-I-F 6CB6
4TH VIDEO-I-F 6CB6
TUNER REMOTE
TUNER
6AU6
6BN6
6AU6
TONE CONTROL
VOLUME CONTROL
ON-OFF VOLUME CONTROL
SENTINEL CHASSIS SPEAKER
ADC CONTROL
VERT. HOLD CONTROL
VERT. LINEARITY CONTROL
VERT. CENTERING CONTROL
HORIZ. HOLD CONTROL
HORIZ. LOCK
HORIZ. DRIVE CONTROL
WIDTH
BOOST 750V
HORIZ. LINEARITY
HORIZ. CENTERING CONTROL
FOCUS CONTROL
HV CONTROL
CONTRAST CONTROL
COLOR CONTROL
CHROMA CONTROL
COLOR DATE CONTROL
BRIGHTNESS CONTROL
GREEN BACKGROUND CONTROL
BLUE BACKGROUND CONTROL
GREEN SCREEN CONTROL
BLUE SCREEN CONTROL
RED SCREEN CONTROL
GREEN VERT. AMPLITUDE CONTROL
BLUE VERT. AMPLITUDE CONTROL
RED VERT. AMPLITUDE CONTROL
GREEN HORIZ. TILT
BLUE HORIZ. TILT
RED HORIZ. TILT
GREEN HORIZ. AMPLITUDE CONTROL
BLUE HORIZ. AMPLITUDE CONTROL
RED HORIZ. AMPLITUDE CONTROL
DEFLECTION YOKE
VERT = 55A
HORIZ = 1A
DO NOT MEASURE
HV INTERLOCK
HV TRANSFORMER TERMINAL BOARD (TB) CONNECTED FROM TOP
HV TRANSFORMER TERMINAL BOARD (TB) CONNECTED FROM BOTTOM
A PHOTOFACT STANDARD NOTATION SCHEMATIC



BLOCK DIAGRAM

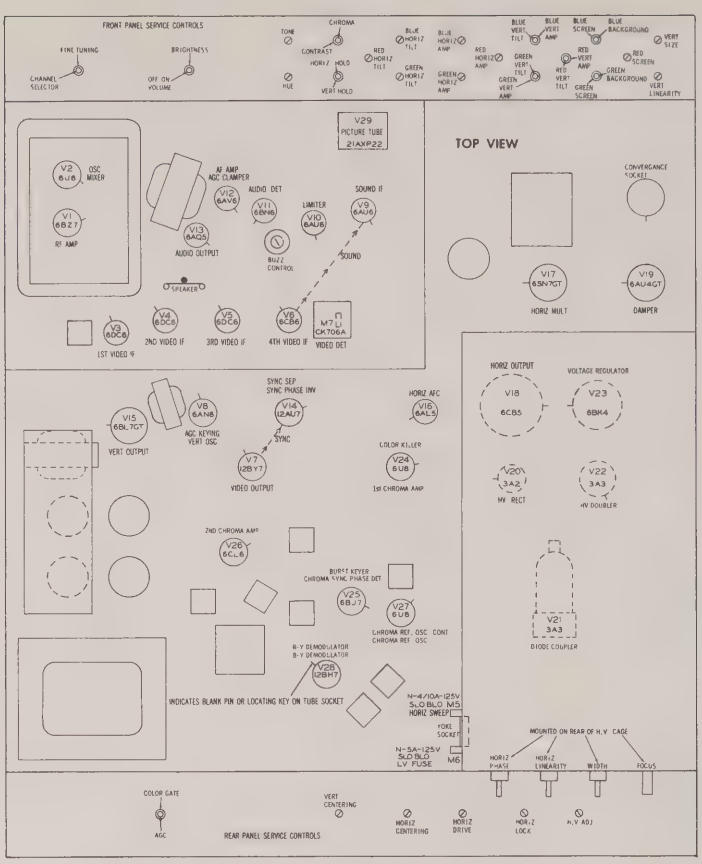
MODEL 816C

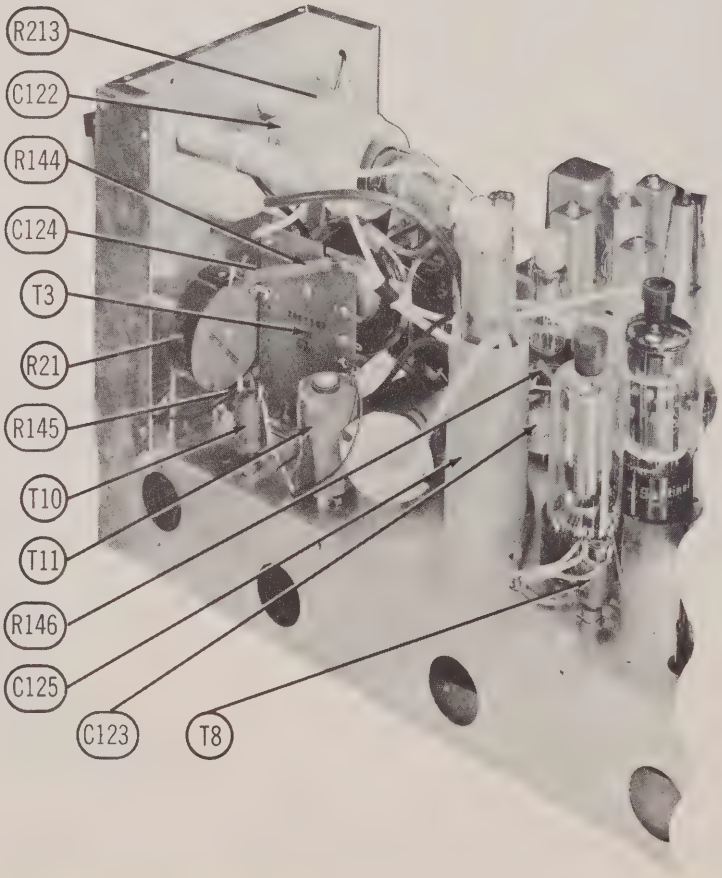
SENTINEL

SET 320 FOLDER 12

PAGE 3

TUBE PLACEMENT CHART





HIGH VOLTAGE COMPARTMENT

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	†500Ω	270KΩ	INF	0Ω	.1Ω	INF	1.5Meg	22Ω	0Ω
V 2	6U8	†13KΩ	200KΩ	†30KΩ	.1Ω	0Ω	†8.2KΩ	0Ω	0Ω	10KΩ
V 3	6DC6	100KΩ	56Ω	0Ω	.1Ω	†3.2KΩ	†3.2KΩ	0Ω		
V 4	6DC6	100KΩ	68Ω	0Ω	.1Ω	†3.2KΩ	†3.2KΩ	0Ω		
V 5	6DC6	50KΩ	56Ω	0Ω	.1Ω	†2.7KΩ	†2.7KΩ	0Ω		
V 6	6CB6	.1Ω	330Ω	0Ω	.1Ω	†500Ω	†500Ω	0Ω		
V 7	12BY7	55Ω	4KΩ	0Ω	.1Ω	.1Ω	0Ω	†5.5KΩ	†3.2KΩ	0Ω
V 8	6AN8	▲1.3Meg	1.5Meg	230Ω	0Ω	.1Ω	500KΩ	‡10KΩ	†22KΩ	†4.7KΩ
V 9	6AU6	100KΩ	0Ω	0Ω	.1Ω	†33KΩ	†33KΩ	0Ω		
V 10	6AU6	47KΩ	0Ω	0Ω	.1Ω	†15KΩ	†15KΩ	0Ω		
V 11	6BN6	300Ω	.6Ω	.1Ω	0Ω	†33KΩ	4.6Ω	†440KΩ		
V 12	6AV6	4.7Meg	180Ω	.1Ω	0Ω	1.5Meg	1.5Meg	†330KΩ		
V 13	6AQ5	470KΩ	270Ω	.1Ω	0Ω	‡3.4KΩ	‡3KΩ	470KΩ		
V 14	12AU7	†4.7KΩ	1Meg	5KΩ	0Ω	0Ω	†30KΩ	2.7Meg	0Ω	.1Ω
V 15	6BL7GT	2.2Meg	‡400Ω	600Ω	2.2Meg	‡400Ω	600Ω	0Ω	.1Ω	
V 16	6AL5	3KΩ	3KΩ	.1Ω	0Ω	4.5Meg	0Ω	4.5Meg		
V 17	6SN7GT	5Meg	‡6KΩ	1.8KΩ	100KΩ	‡120KΩ	1.8KΩ	.1Ω	0Ω	
V 18	6CB5	NC	.1Ω	0Ω	TP	470KΩ	TP	0Ω	‡12KΩ	TOP CAP ▲13Ω
V 19	6AU4GT	NC	NC	300KΩ	NC	‡40Ω	NC	0Ω	.1Ω	
V 20	3A2	15Meg	15Meg	NC	15Meg	15Meg	15Meg	NC	15Meg	15Meg TOP CAP ▲38Ω
V 21	3A3	PINS	1 - 8	HAVE	INF	RESISTANCE				TOP CAP 15Meg
V 22	3A3	PINS	1 - 8	HAVE	INF	RESISTANCE				TOP CAP INF
V 23	6BK4	†1KΩ	0Ω	NC	NC	1.2Meg	NC	.1Ω	NC	TOP CAP INF
V 24	6U8	†15KΩ	450KΩ	†11KΩ	.1Ω	0Ω	†600Ω	0Ω	0Ω	3Meg
V 25	6BJ7	1.5Meg	1.8Ω	TP	.1Ω	0Ω	1.8Ω	220Ω	1.5Meg	1.8Ω
V 26	6CL6	0Ω	400Ω	‡20KΩ	0Ω	.1Ω	‡4KΩ	0Ω	‡20KΩ	400Ω
V 27	6U8	†600Ω	100KΩ	†11KΩ	.1Ω	0Ω	†600Ω	0Ω	2.7KΩ	1.5Meg
V 28	12BH7	‡40KΩ	17KΩ	6.8KΩ	0Ω	0Ω	†15KΩ	17KΩ	‡6.8KΩ	.1Ω
V 29	21AXP22	†100KΩ	‡100KΩ	▲400Ω-600KΩ	‡40KΩ	‡40KΩ	‡80KΩ	▲20Ω - 400KΩ	NC	10Meg
							PIN 11 ▲20-400KΩ	PIN 12 ‡100KΩ	PIN 13 ‡40KΩ	PIN 14 †100KΩ

† MEASURED FROM POSITION SIDE OF C2.
‡ MEASURED FROM POSITIVE SIDE OF C1.
▲ MEASURED FROM PIN 3 OF V19.
TP - TIE POINT
NC - NO CONNECTION

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage shock hazard should be eliminated. This may be done by disconnecting pin 3 of the horizontal output tube (V18) from the chassis and inserting a 2000Ω, 10 watt resistor from pin 3 of V18 to chassis. Then remove the horizontal multivibrator tube (V17) from its socket.

VIDEO IF ALIGNMENT

Connect the negative lead of a 3 volt battery to the ungrounded side of C6. Connect the positive lead to chassis. Use only enough signal generator output to provide usable reading on VTVM. The local oscillator may be disabled by removing the oscillator strip for an unused channel and switching the channel selector to that channel. This will reduce the possibility of erroneous indications during alignment.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side thru .1 ungrounded tube shield floating over converter tube V2. Low side to chassis.	47.25MC Unmod.	Any	DC probe thru 10KΩ to point (A). Common to chassis.	A1	Adjust for MINIMUM deflection.
2.			42.75MC	"	"	A2	Attenuate signal generator output to maintain 1 volt at VTVM. Adjust for maximum deflection.
3.			46.2MC	"	"	A3	Adjust for maximum deflection. Repeat steps 1 thru 3 until no change is noted.
4.			43.5MC	"	"	A4	Attenuate signal generator output to maintain 1 volt at VTVM. Adjust for maximum deflection.
5.			44.4MC	"	"	A5	"
6.			45.5MC	"	"	A6	"
7.			47.25MC	"	"	A7	Adjust for MINIMUM deflection.
8.			41.25MC	"	"	A8	"
9.			45.75MC	"	"	A9	Attenuate signal generator output to maintain 1 volt at VTVM. Adjust for maximum deflection.
10.			42.75MC	"	"	A10	"

OVERALL VIDEO IF RESPONSE CHECK

Connect bias as under "Video IF Alignment". In steps 12 through 14 adjust for -4 volts bias. Remove bias to observe trap markers. If sweep generator has no built marker, couple a separate marker loosely to sweep generator output. Attenuate sweep generator output to provide not more than 6 volts peak to peak on scope. Connect a 68 ohm carbon resistor across sweep generator output. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	.005MFD	High side thru .005MFD capacitor to pin 5 (plate) of 3rd Video IF Amplifier Tube V3. Low side to chassis.	44.3MC 30MC Swp.	41.25MC 41.65MC 45.3MC 47.25MC	Any	Vert. amp. thru 10KΩ to point (A). Low side to chassis.	A1, A2, A3	Adjust A2 and A3 for response curve similar to Fig. 1. If necessary SLIGHTLY retouch A1 to place 41.25MC trap marker in trap notch as in Fig. 1.
12.		High side to pin 7 (grid) of 3rd Video IF Amplifier Tube V3. Low side to chassis near V3		41.25MC 41.65MC 45.3MC 45.75MC 47.25MC	"	"	A4, A5, A6	Increase bias to -4 volts at ungrounded side of C6 and chassis. Attenuate sweep generator output to produce 6 volts peak to peak on scope. Adjust for response curve similar to Fig. 2. A4 affects tilt. A5 affects bandwidth on low frequency end. A6 affects high frequency side and position of 45.75MC marker.
13.	Direct	High side to an ungrounded tube shield floating over converter tube V2. Low side to chassis	"	41.25MC 41.65MC 45.75MC 47.25MC	"	Vert. Amp. thru detector (Fig. 5) to pin 5 (plate) of 1st Video IF Amplifier Tube (V3). Low side to chassis.	A8, A9, A10	Connect a short clip lead across the 47.25MC trap coil (L6). Check for response curve similar to Fig. 3. If necessary, adjust A9 and A10 for desired response. SLIGHTLY retouch A8 to place 41.25MC marker in trap notch as in Fig. 3. Remove short from (L6).
14.			"	41.25MC 41.65MC 45.3MC 45.75MC 47.25MC	"	Vert. amp. thru 10KΩ to point (A). Low side to chassis.		Check for overall IF response curve similar to Fig. 4. If necessary SLIGHTLY retouch A4, A5, and A6 for desired response. Check position of 41.25MC and 47.25MC traps. If necessary, increase generator output and SLIGHTLY retouch A1 (41.25MC) and A7 (47.25MC) to place markers in trap notches as in Fig. 4.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR, AM SIGNAL GENERATOR AND OSCILLOSCOPE

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. Set volume control at low volume level.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
15.	.01MFD	High side to point (B). Low side to chassis	4.5MC 400~ Mod (50KC Swp.)	4.5MC	Any non-interfering channel	Across secondary of Audio Output Trans (T5)	A11	Set buzz control (R32) 90° from maximum clockwise rotation. Adjust A11 for maximum 400~ indication on scope.
16.							A12, A13, A14	Attenuate generator output so that signal is below the limiting level of the 6BN6 as evidenced by background hiss in the speaker. Adjust A12, A13 and A14 for maximum 400~ indication on scope.
17.				4.5MC 400~ Mod.			R22	Use a high generator output and adjust R22 for MINIMUM 400~ indication on scope.
18.				4.5MC	"	"	A11	With volume control at low level, retouch A11 for maximum 400~ indication on scope.

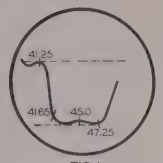


FIG. 1

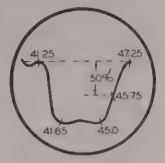


FIG. 2

FIG. 3

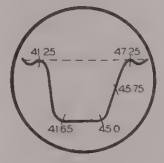


FIG. 4

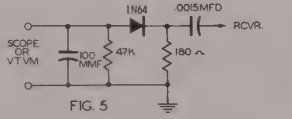


FIG. 5

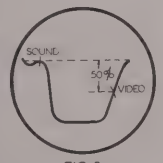


FIG. 6

FIG. 7

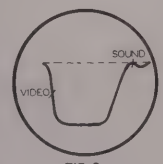


FIG. 8

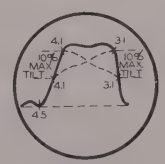


FIG. 9

OSCILLATOR ALIGNMENT

Replace the local oscillator strip back in tuner. The channel oscillator adjustment screws are reached thru a hole just to the left of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel. Use only enough sweep generator output to provide usable pattern on scope. Leave bias connected as under "Overall Video IF Response Check" and connect a jumper from ungrounded side of C6 to the tuner AGC terminal. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms. Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
19.	Two 120Ω Carbon Resistors	Across antenna terminal with 120Ω in each lead.	213MC (10MC Swp.)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A16	Adjust to place sound marker as in Fig. 6. Video marker should be at 50%.
			207MC (10MC Swp.)	205.25MC 209.75MC	12		A18	
			201MC (10MC Swp.)	199.25MC 203.75MC	11		A17	
			195MC (10MC Swp.)	193.25MC 197.75MC	10		A18	
			189MC (10MC Swp.)	187.25MC 191.75MC	9		A19	
			183MC (10MC Swp.)	181.25MC 185.75MC	8		A20	
			177MC (10MC Swp.)	175.25MC 179.75MC	7		A21	
			85MC (10MC Swp.)	83.25MC 87.75MC	6		A22	
			79MC (10MC Swp.)	77.25MC 81.75MC	5		A23	
			69MC (10MC Swp.)	67.25MC 71.75MC	4		A24	
			63MC (10MC Swp.)	61.25MC 65.75MC	3		A25	
			57MC (10MC Swp.)	55.25MC 59.75MC	2		A26	

RF AND MIXER ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
20.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp.)	205.25MC 209.75MC	12	Vert. amp. thru 10KΩ to point (A). Low side to chassis.	A27, A28, A29	Adjust for response similar to Fig. 7 with markers above 90%.
21.	"	"	213MC (10MC Swp.)	211.25MC 215.75MC	13	"		If markers fall below 70% on any channel, make compromise adjustment of A27, A28, and A29 with channel switch set to that channel, then check all other channels to see that they have not been seriously affected.
			201MC (10MC Swp.)	199.25MC 203.75MC	11			
			195MC (10MC Swp.)	193.25MC 197.75MC	10			
			189MC (10MC Swp.)	187.25MC 191.75MC	9			
			183MC (10MC Swp.)	181.25MC 185.75MC	8			
			177MC (10MC Swp.)	175.25MC 179.75MC	7			
			85MC (10MC Swp.)	83.25MC 87.75MC	6			
			79MC (10MC Swp.)	77.25MC 81.75MC	5			
			69MC (10MC Swp.)	67.25MC 71.75MC	4			
			63MC (10MC Swp.)	61.25MC 65.75MC	3			
			57MC (10MC Swp.)	55.25MC 59.75MC	2			

44MC TRAP ADJUSTMENT

The IF trap adjustment (A30) is for the purpose of eliminating interference in the IF range. Tune to the channel on which interference is noted and adjust A30 for MINIMUM interference. Check to see that reception on channel 2 has not been affected.

OVERALL VIDEO IF AND TUNER RESPONSE CHECK

Connect bias as under "Overall Video IF Response Check" and connect jumper from ungrounded side of C6 to the tuner AGC terminal. Use only enough sweep generator output to provide usable pattern on scope. Connect a 68 ohm carbon resistor across the sweep generator output. The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
22.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp.)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.		Check for response curve similar to Fig. 8. If necessary SLIGHTLY retouch A4, A5, and A6 for desired response.

CHROMA BANDPASS AMPLIFIER ALIGNMENT

Remove the chroma reference oscillator tube (6U8/ V27) from its socket. Connect a short clip lead from pin 9 of the color killer tube (V24) to chassis. Connect the negative lead of a 5 volt bias supply to point (D). Positive to chassis. Replace V17 in its socket. Remove 200 ohm/ 10 watt resistor from pin 3 of V18 and reconnect V18 to chassis.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
23.	3.9KΩ Carbon Resistor	High side to point (B). Low side to chassis.	Not used	4.5MC (Unmod.)	Any	Use VTVM DC probe to pin 1 (cathode) of color phase detector tube (V24B). Common to chassis.	A34, A35	Attenuate signal generator output ot maintain not more than 5 volts on VTVM. Adjust for MINIMUM deflection. Retouch A11 for MINIMUM.
24.	"	"	"	4.1MC	"	"	A35	Adjust for maximum deflection.
25.	"	"	"	3.0MC	"	"	A36	"
26.	Connect a .05MFD capacitor from pin 2 of 1st chroma amplifier V24B to chassis. Replace V27 in its socket. Connect vert. amplifier of scope to point (B). Low side to chassis. Adjust A37 for MINIMUM amplitude of hash on scope, then adjust the 2nd chroma amplifier screen by-pass trimmar (A38) for MINIMUM hash. Repeat adjustments of A37 and A38 until a position of A37 is found with MINIMUM hash. Remove .05MFD from pin 2 of V24B.							
27.	3.9KΩ Carbon Resistor	High side to point (B). Low side to chassis.	3MC (10MC Swp.)	3.1MC 4.1MC 4.5MC	Any	Vert. Amp. thru detector (Fig. 5) to pin 6 of R-Y demodulator (V28B). Low side to chassis.		Couple a marker generator loosely to pin 2 of V24B (1st chroma Amp. tube). Remove V28 from its socket. Check for response curve similar to Fig. 9. If necessary SLIGHTLY retouch A35 and A36 for desired response.

SENTINEL MODEL 816C

ALIGNMENT INSTRUCTIONS (cont)

3.58MC TRAP ALIGNMENT

Set brightness and contrast controls fully clockwise.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
28.	.005MFD	High side to point (A). Low side to chassis.	Not used	3.58MC (400∿ Mod)	Any	Vert. Amp. thru detector (Fig. 5) to pin 5 (cathode) of picture tube. Low side to chassis.	A39	Adjust for MINIMUM 400∿ Mod. on scope. Remove 200Ω/2 Watt resistor from pin 3 of V18 to chassis. Connect pin 3 of V18 to chassis. Replace V17 in its socket.

CHROMA REFERENCE OSCILLATOR ALIGNMENT

1. Connect the DC probe of a VTVM to point (D). Common to chassis.
Adjust the reference oscillator plate coil slug (A31) for maximum negative reading on VTVM. Remove VTVM.
2. Connect the vertical amplifier of scope to point (E). Low side to chassis. Adjust the bottom slug of the chroma reference oscillator coil (A32) for maximum indication on scope. Turn the top slug of the chroma reference oscillator coil slug (A33) two turns in either direction. Readjust A32 again for maximum indication on scope. Continue adjusting A32 and A33 until a position of A33 is found that gives maximum indications on scope. Check peak to peak voltage on scope at point (E).
3. Connect the vertical amplifier of scope to point (F). Low side to chassis. Check the peak to peak voltage at point (F). It should be the same as at point (E). If necessary, repeat step 2. Remove scope.
4. Connect a color bar generator across antenna terminals. Connect a short clip lead from point (I) to chassis. Check color oscillator sync. If necessary, adjust A31 until the color bars appear to move slowly from one side of the screen to the other. Remove short from point (I) and chassis. Color bars should now be in sync.

BURST COIL ADJUSTMENT

Connect a color bar generator across antenna terminals. Set the hue control at one half mesh position. Turn the contrast control fully counter clockwise. Turn the chroma control one half turn from its maximum counter clockwise position. Connect DC probe of VTVM to pin 1 of color phase detector (V25). Common to chassis. Adjust the burst coil slug (A40) for maximum deflection on VTVM.

R-Y AND B-Y BALANCE ADJUSTMENT

Connect a color bar generator across antenna terminals. Connect the vertical amplifier of the scope through a low capacity probe to point (J). Low side to chassis.
Set the hue control to one half mesh. Adjust A40 until the color bars appear in their proper ratios as in Fig. 10, B-Y. When the proper relationship is obtained move the scope probe to point (K). Adjust A41 until the color bars appear on the scope in their proper ratio as in Fig. 10, R-Y. When ratios cannot be brought within reasonable tolerance, slight corrections can be made with the hue and chroma controls.

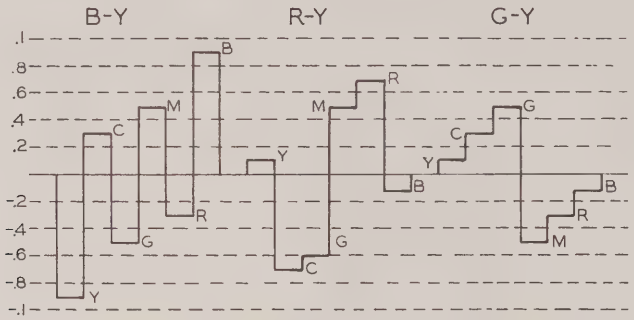
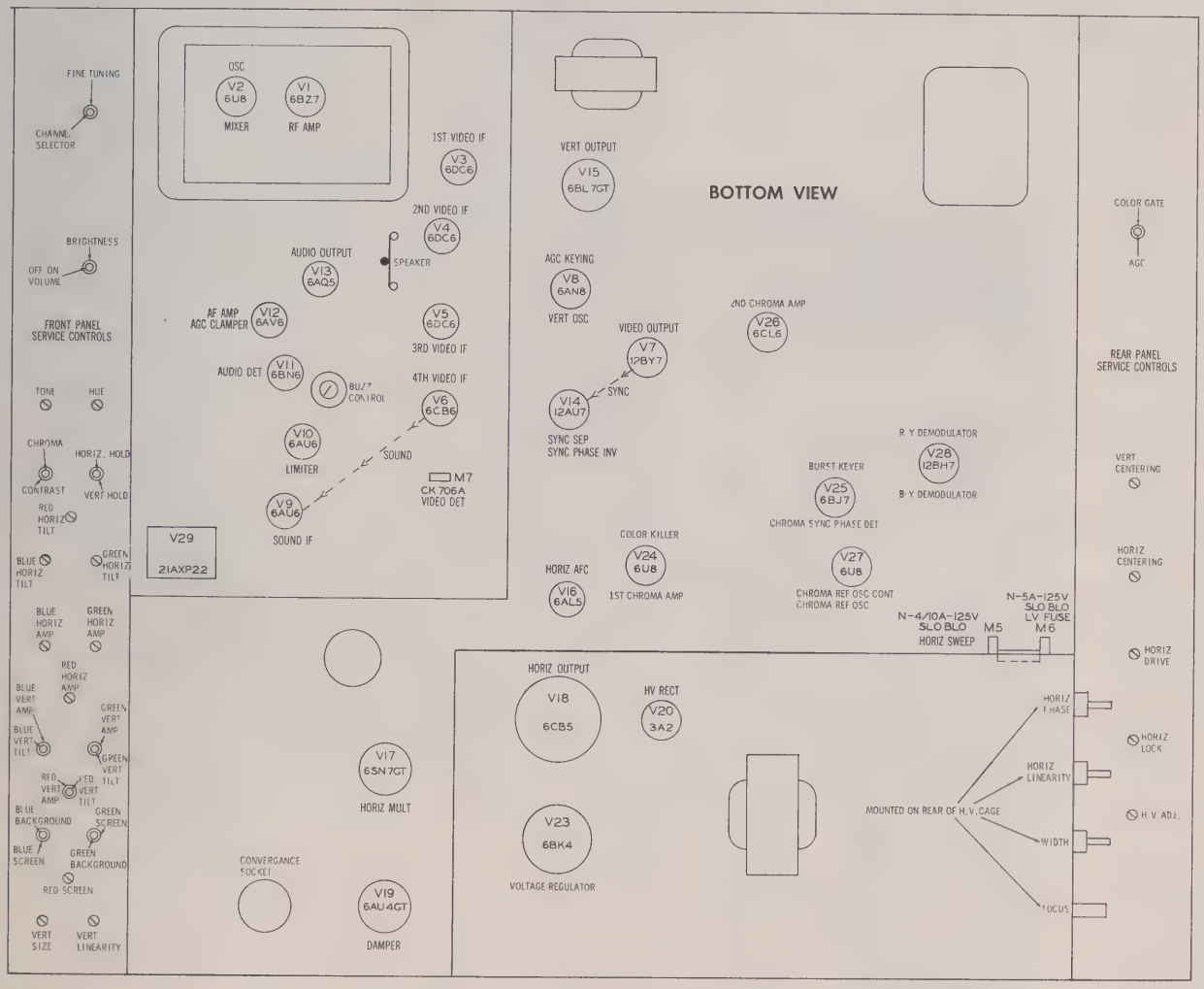
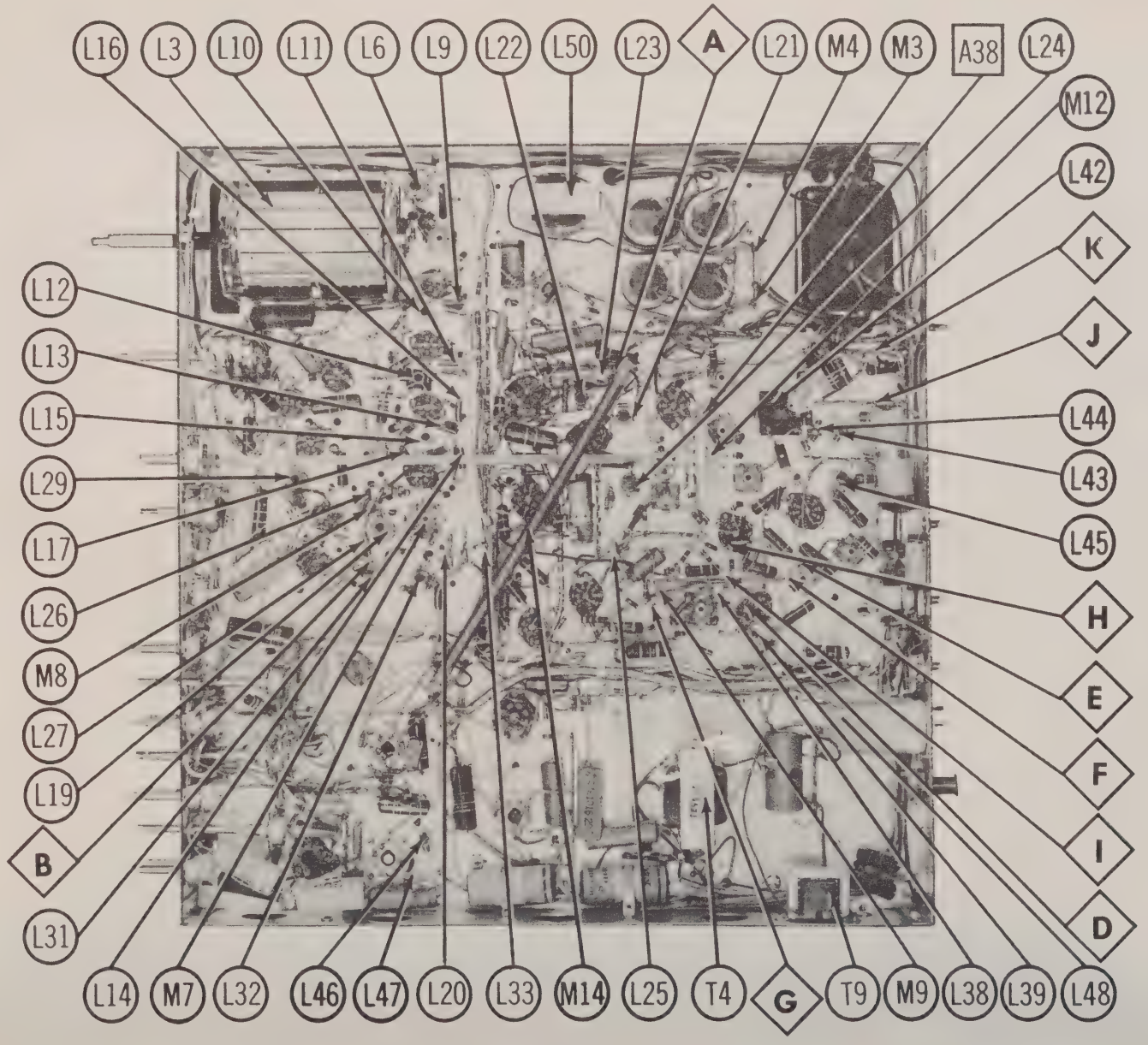


FIG. 10

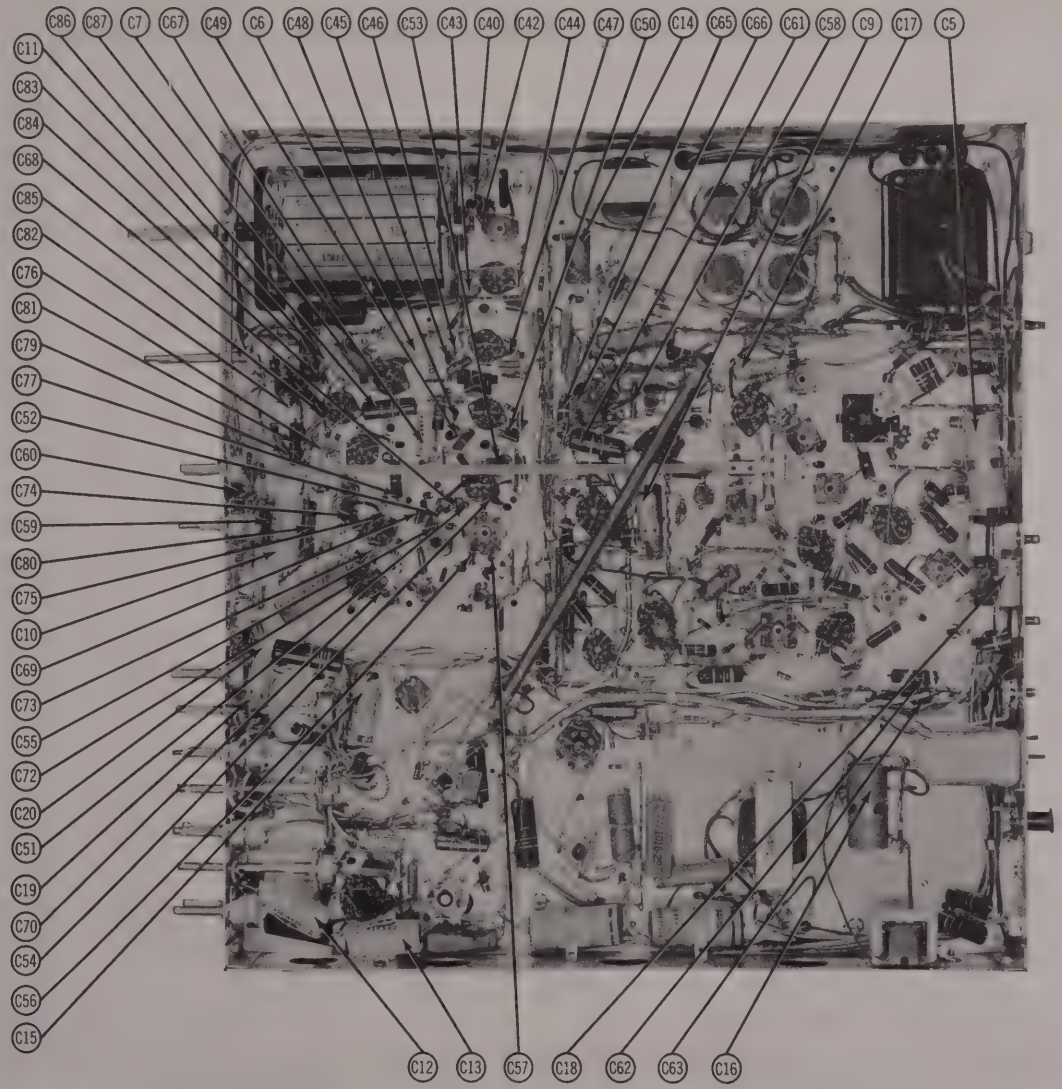
TUBE PLACEMENT CHART



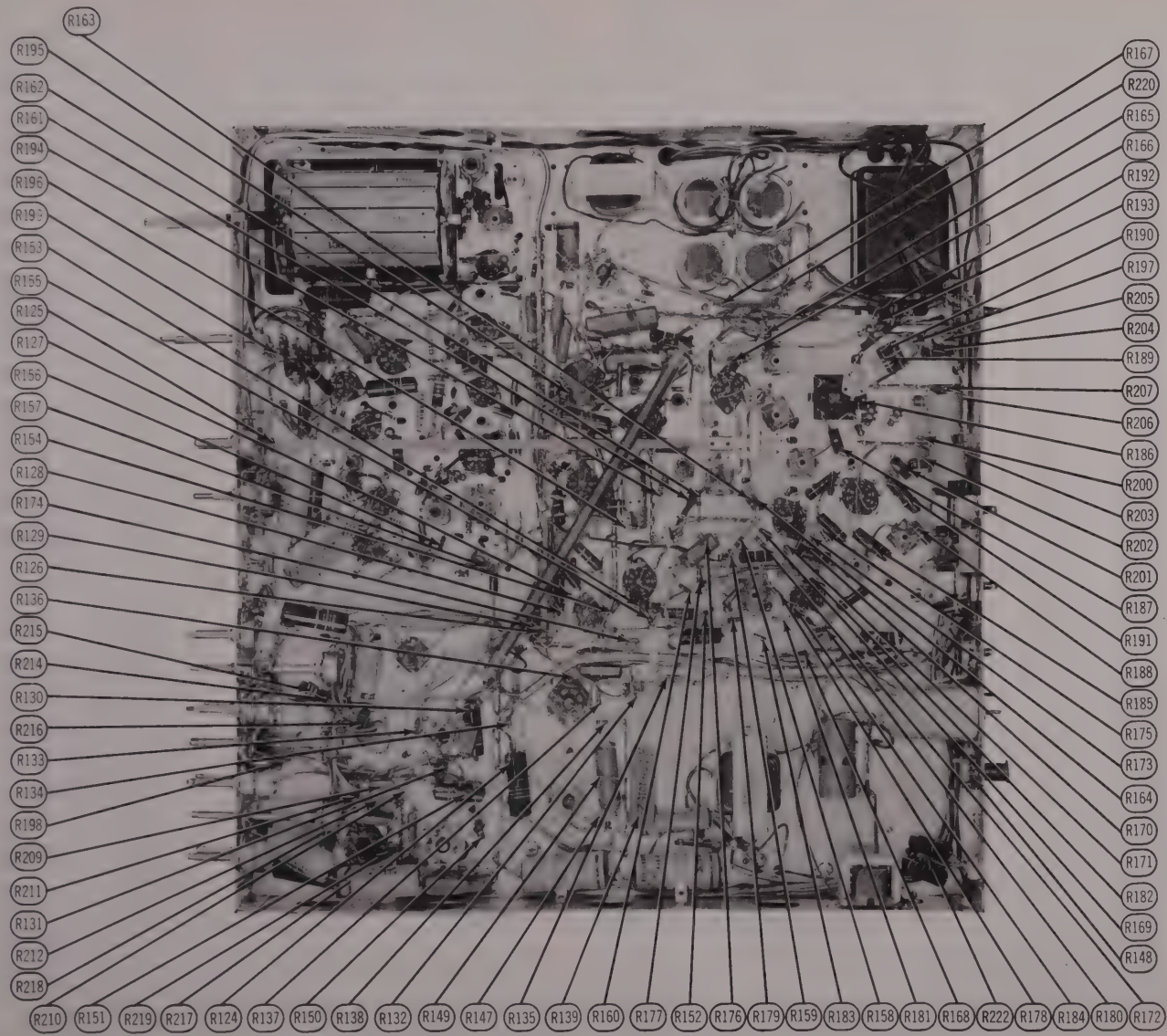
SENTINEL
MODEL 816C



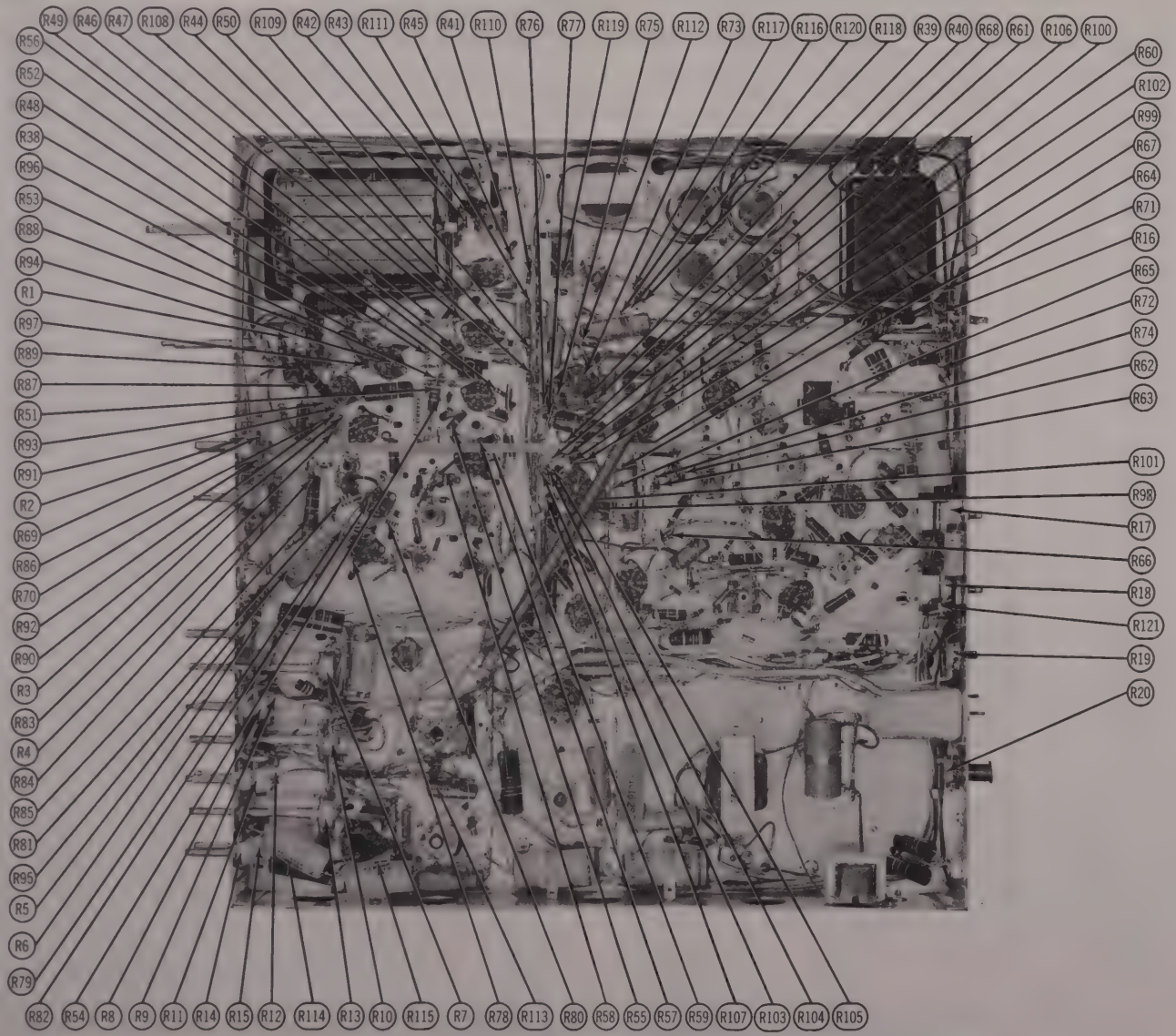
CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION



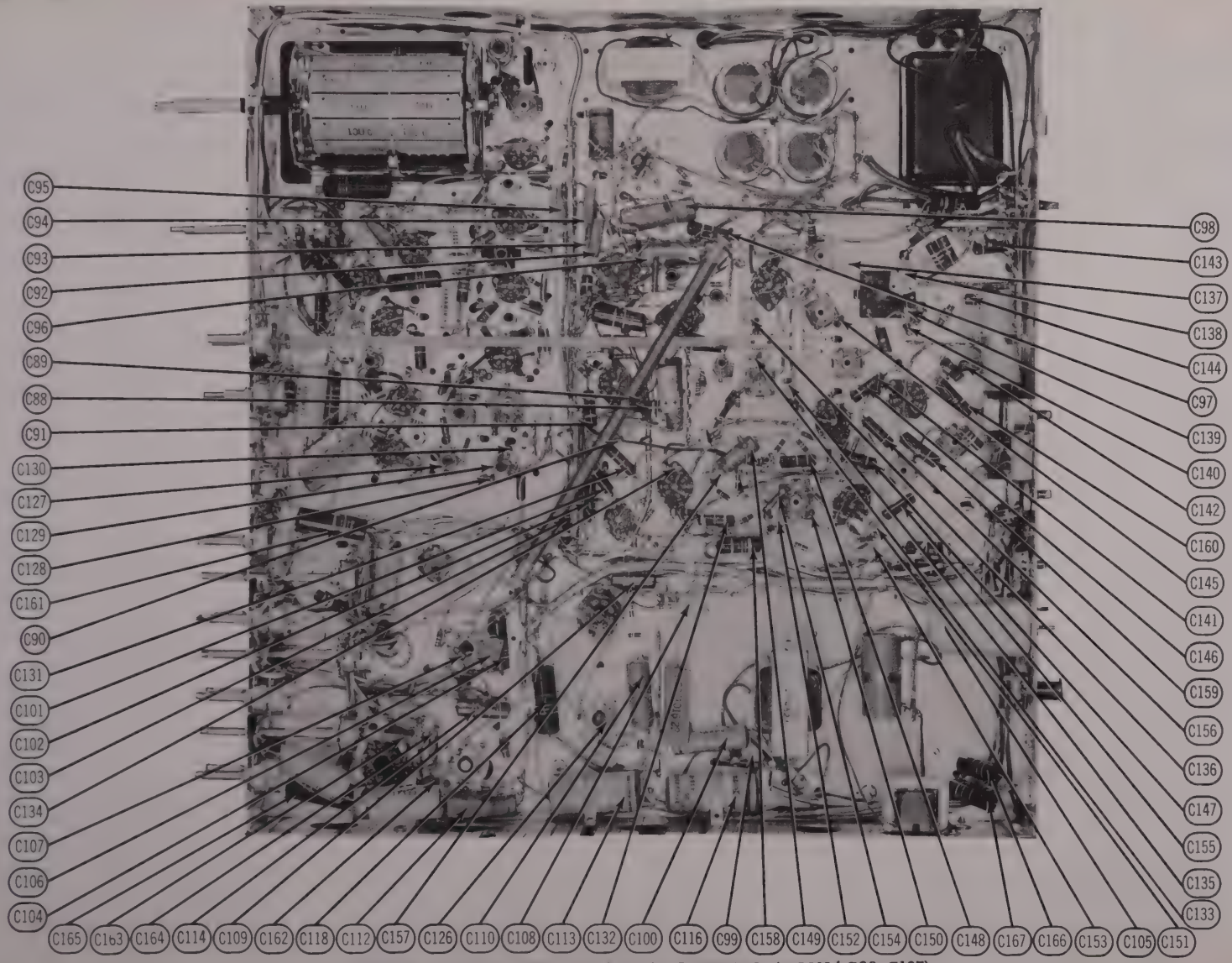
CHASSIS BOTTOM VIEW CAPACITOR IDENTIFICATION (C6-C87)



CHASSIS BOTTOM VIEW RESISTOR IDENTIFICATION (R124-R222)

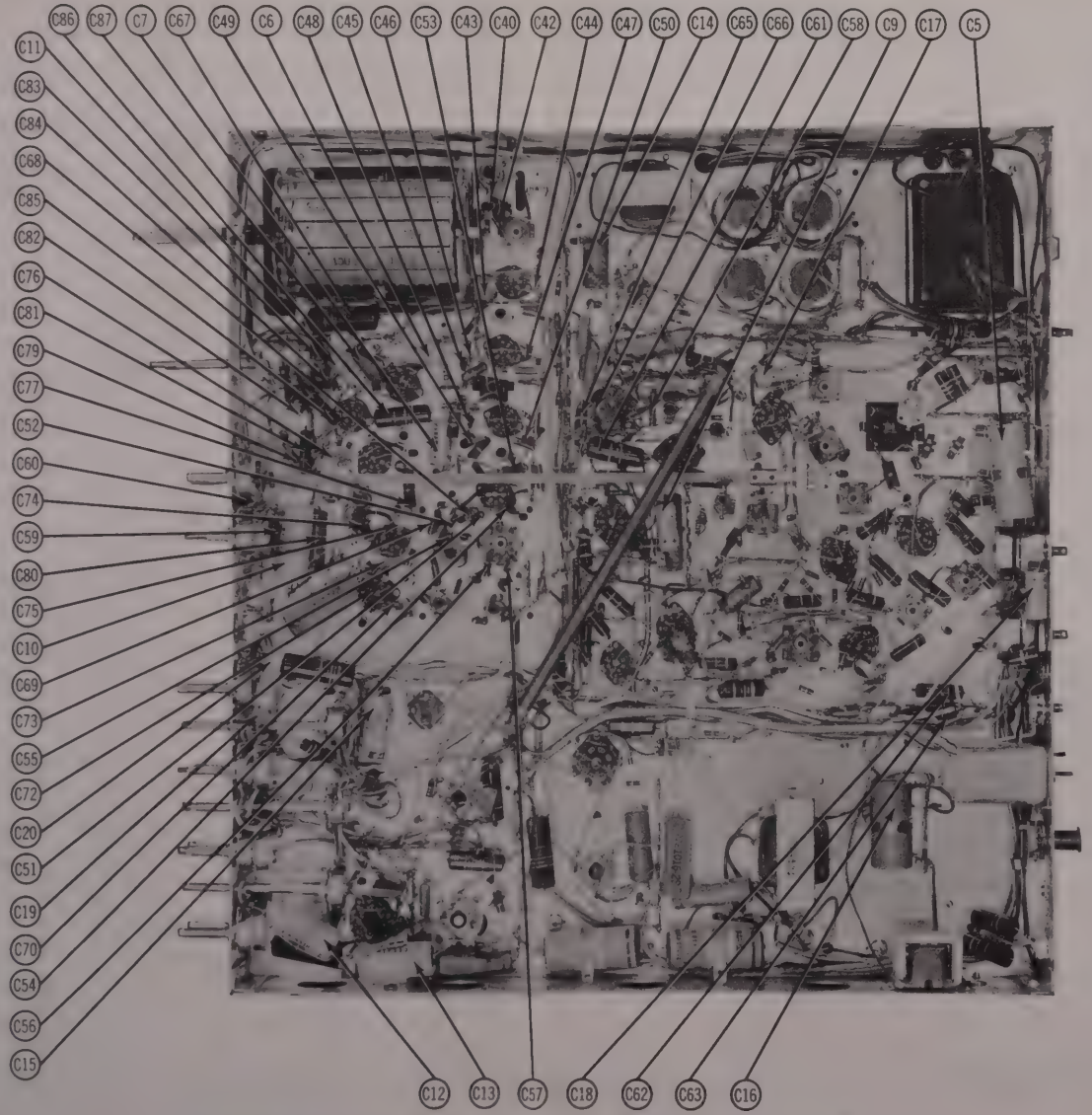


CHASSIS BOTTOM VIEW RESISTOR IDENTIFICATION (R1-R120)



CHASSIS BOTTOM VIEW CAPACITOR IDENTIFICATION (C88-C167)

SET 320 FOLDER 12



CHASSIS BOTTOM VIEW CAPACITOR IDENTIFICATION (C6-C87)

MISCELLANEOUS ADJUSTMENTS

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably with a test pattern.

Turn the horizontal drive control (R19) as far clockwise as possible without the presence of vertical white lines or compression near the center of the picture.

Adjust the horizontal centering control (R18) to center picture preferably while viewing a test pattern.

Set the horizontal hold control (R4B) to its mid-range position. Adjust the horizontal lock slug (B1) counter clockwise while switching on and off channel until picture looses sync. Turn B1 clockwise and note the number of diagonal bars just before the picture pulls into sync. There should be less than two bars if the horizontal circuit is operating properly. Continue turning B1 clockwise while switching on and off channel until sync is again lost, then turn B1 counter clockwise and note the point where picture falls into sync. Turn B1 one more half turn counter clockwise.

Adjust the horizontal width slug (B2) for a picture slightly wider than is necessary to fill the picture mask horizontally. Remove 400 MA fuse and connect a 0-500 MA meter across the 400 MA fuse holder and adjust the horizontal linearity slug (B3) for MINIMUM reading on the meter.

HIGH VOLTAGE ADJUSTMENT

Connect DC voltmeter across cathode resistor R149 between pin 1 of 6BK4 (V23) and the 400 volt line.

Adjust the "HV ADJUST" control for .7 volts on the low DC volt scale.

Measure the high voltage at the plate cap of V23 using a 30,000 volt probe attached to the voltmeter. If voltage is higher than 25,000 volts, adjust "HV ADJUST" so that it does not exceed 25,000 volts.

COLOR PURITY ADJUSTMENT

Allow 15 minute warm-up period for the receiver and equipment. Check the horizontal linearity with a cross hatch or vertical bar generator and readjust if necessary for good linearity.

Set the horizontal and vertical hold controls for proper sync with an on the air signal.

Switch to an unused channel and connect a dot generator to the receiver following instructions of generator manufacturer. Adjust dot generator for a stable pattern. Do not use vertical or horizontal hold controls on the receiver for this purpose.

Turn all vertical and horizontal amplitude and vertical tilt controls to full counter clockwise position.

Pull all edge magnets to full out position. These are located at the outer rim of the picture tube.

Check position of Convergence Yoke Assembly which is located behind the deflection yoke assembly. The Blue magnet should be directly over the blue gun and the assembly should be located about 2 and 7/8 inches from the front of the picture tube base.

By adjusting the knurled screws on the "Blue, Green and Red positioning magnets", converge the dots at the center of the screen. Do not use the amplitude or tilt controls to converge the dots.

Loosen the two screws at the base of the deflection yoke bracket and slide the assembly back from the bell of the picture tube.

Remove the dot generator connection from the antenna terminals and connect a jumper across the terminals.

Turn the contrast control fully counter clockwise.

Turn the red screen control to the full clockwise position.

Turn the brightness control up to a bright raster. Connect clip leads from the blue and green grids of the picture tube to the chassis.

Rotate the purity magnet or each ring of the magnet until a pure red field is located at the center of the screen. Disregard color contamination at the edges of the screen.

Slide the deflection yoke forward until the maximum overall red screen is obtained over the entire screen. Do not tilt the yoke.

Readjust the purity magnet to obtain the best overall red screen. Tighten the yoke.

To check the blue field, remove the clip lead from the blue grid and connect it to the red grid. Turn the "red screen" down and the "blue screen" control up.

The green field is checked by moving the clip lead from the green grid to the blue grid, turning the "blue screen" down and the "green screen" up. If overall red, blue or green purity cannot be obtained (disregarding slight edge contamination) the purity adjustments should be repeated. If overall red, blue and green purity is still unobtainable, a slight compromise of the colored fields should be made with the red being favored slightly.

Connect the blue and green grids of the picture tube to ground with clip leads. Turn the "red screen" control to the maximum clockwise position. Adjust the edge magnets to eliminate all color contamination from the edge of the picture screen.

Adjust the receiver for a white raster. See "Screen and Background Control Adjustments".

DYNAMIC CONVERGENCE ADJUSTMENTS

Set all amplitude and tilt controls fully counter clockwise. Adjust the Blue, Green and Red positioning magnets located on the Convergence Yoke Assembly to statically converge the dots at the center of the screen. The blue dot may be moved horizontally by adjusting the Blue Beam Corrector Magnet if necessary.

Turn all amplitude and vertical tilt controls up one fourth turn.

Adjust the "Red and Green Horizontal amplitude and tilt" controls until the red and green dots are parallel to each other in a horizontal plane throughout the horizontal row of dots across the screen.

Next, the Blue Horizontal amplitude and tilt controls are used to bring the blue dot into the line with the red and green dots horizontally.

The blue vertical amplitude and tilt controls are then adjusted to position the blue dot so that the separation between the three dots are equal in a vertical direction. These adjustments are made while concentrating on the center vertical line. The red and green vertical amplitude and tilt controls are then adjusted to position the red and green dots so that the center row of vertical dots are spaced equally apart and parallel to each other in a vertical direction.

If necessary, readjust the horizontal amplitude and tilt controls so that the vertical center line of dots are separated equally and are parallel to each other in a horizontal direction.

Carefully inspect all groups of dots as to separation and plane making slight adjustments if necessary.

Using the Red, Blue and Green Positioning Magnets, converge the dots. Only very slight adjustments should be made to correct convergence.

BACKGROUND AND SCREEN CONTROL ADJUSTMENTS.

Set the brightness control slightly above viewing level.

Set Chroma, Contrast, Green screen and background, Blue screen and background and Red Screen controls fully counter clockwise.

Set the Blue background, Green background and Red screen one fourth turn clockwise. Color of raster should now be red. If color is purplish, increase red screen and reduce blue background slightly. If color is yellowish, reduce green background. Rotate the blue screen slowly clockwise until the color of the raster becomes a pale purple. If blue screen has no effect on the color of the raster, turn up the blue background just below the point where the screen starts to turn bluish.

Advance the green screen control until the raster becomes white. If the Green screen control has no effect on the color, turn up the green background control slightly. A slight readjustment of the Red, Green and Blue screen controls may be necessary to produce a good white picture. If the raster still has a color tint after making these adjustments, carefully reduce the screen control relating to the color of the picture color. If the color is a yellowish tint, turn the blue screen up slightly. If the color is cyan (greenish blue), turn up the red screen slightly. If the color is purplish, increase the green screen slightly.

Rotate the contrast control clockwise one fourth turn, reduce the brightness until only the brightest portions of a telecast picture are visable. Do not readjust any screen controls. Adjust only the Blue and Green background controls until the brightest portions of the picture become white.

Turn the brightness control up to normal level.

There should be no color tinting of the picture between low brightness setting and just above normal brightness setting. If tinting occurs at high settings of brightness, the screen controls must be readjusted slightly. If tinting occurs at low brightness settings, the Blue or Green background controls must be readjusted slightly. It is important that the screen and background controls be adjusted properly for a black and white picture as this will affect the coloring of a color telecast.

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	NOTES
V1	RF Amplifier	6BZ7	6BZ7	
V2	Mixer-Oscillator	6U8	6U8	
V3	1st. Video IF Amplifier	6DC6	6DC6	
V4	2nd. Video IF	6DC6	6DC6	
V5	3rd. Video IF	6DC6	6DC6	
V6	4th. Video IF	6CB6	6CB6	
V7	Video Output	12BY7	12BY7	
V8	AGC Keying-Vert. Osc.	6AN8	6AN8	
V9	Sound IF Amplifier	6AU6	6AU6	
V10	Limiter	6AU6	6AU6	
V11	Audio Detector	6BN6	6BN6	
V12	AF Amplifier-AGC Clamper	6AV6	6AV6	
V13	Audio Output	6AQ5	6AQ5	
V14	Sync Separator-Sync Phase Inverter	12AU7	12AU7	
V15	Vert. Output	6BL7GT	6BL7GT	
V16	Horiz. AFC	6AL5	6AL5	
V17	Horiz. Mult.	6SN7GT	6SN7GT	
V18	Horiz. Output	6CB5	6CB5	
V19	Damper	6AU4GT	6AU4GT	
V20	HV Rectifier	3A2	3A2	
V21	Diode Coupler	3A3	3A3	
V22	HV Doubler	3A3	3A3	
V23	HV Regulator	6BK4	6BK4	
V24	Color Killer-1st. Chroma Amplifier	6U8	6U8	
V25	Burst Keying-Chroma Sync Phase Detector	6BJ7	6BJ7	
V26	2nd. Chroma Amplifier	6CL6	6CL6	
V27	Chroma Ref. Osc. Control-Chroma Ref. Osc.	6U8	6U8	
V28	R-Y Demodulator-B-Y Demodulator	12BH7	12BH7	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: SENTINEL PART No.	CBS PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	NOTES
V29	21AXP22			21AXP22	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: SENTINEL† PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1	200	250	25E94	RE1027	C017	FP126	TM-200-250	S-160 MT-2540	R2067
C2	200	250	25E94	RE1027	C017	FP126	TM-200-250	S-160 MT-2540	R2067
C3	90	450	25E95	AFH1-57	A057	FP187	TM-90-475	S-305	TVL-1850
C4	200	250	25E96	RE1027	C017	FP126	TM-200-250	S-160 MT-2540	R2067
C5	1000	15	25E90	PRS15V1000	BRH1510	TC1501	TD-1000-15	S-020	TVA-1163
C6	2	25	25E88	PRS50V2	BBR2-50T	TC302	TD-2-25	MT-0502	TVA-1201
C7	10	25	25E8	PRS25V10	BR102	TC22	TD-10-25	FM-0210	TVA-1204
C8A	▬10	450	25E97	AFH4-10	D048	FP424	TM-4018	Q-330	TVL-4723
B	10	25							
C	▲10	450							
D	■10	450							
C9	4	150	25E99	PRS150V4	BR415	TC40	TD-4-150	FM-1504	TVA-1402
C10	10	450	25E70	PRS450V10	BR1045	TC72	TD-10-450	FM-4510	TVA-1705
C11	10	25	25E8	PRS25V10	BR102	TC22	TD-10-25	FM-0210	TVA-1204
C12	10	450	25E70	PRS450V10	BR1045	TC72	TD-10-450	FM-4510	TVA-1705
C13	10	450	25E70	PRS450V10	BR1045	TC72	TD-10-450	FM-4510	TVA-1705
C14	4	50	25E98	SRE50V5	BBR4-50T	TC30	TD-4-50	MMT-0505	TVA-1303
C15	25	50	25E101	PRS50V25	BR255	TC36	TD-25-50	FM-0525	TVA-1306
C16	500	3	25E89 (Note 1)	PRS6V500	BRH610 * BRH610	TC412	TD-500-3NP	MT-06100 * MT-06100	R2195
C17	4	150	25E99	PRS150V4	BR415	TC40	TD-4-150	FM-1504	TVA-1402
C18	10	25	25E8	PRS25V10	BR102	TC22	TD-10-25	FM-0210	TVA-1204
C19	10	25	25E8	PRS25V10	BR102	TC22	TD-10-25	FM-0210	TVA-1204
C20	100	6	25E102	SRE6V100	BBR100-6T	TC2501	TD-100-6	MTH-0610	TVA-1101

Note 1. Item C16 is a non-polarized unit.
* Connect negative leads together.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	SENTINEL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C21	3-9				829-10					
C22	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C23	3			NP0-SI3	TCZ-3R3	Z007	NP0A-030	ZT-553	5TCCB-V33	
C24	.5-3				829-3		3115-01-0R5	CT565A		
C25	47			BPD-000047	DD-470	G033	831-470	UC-5447	5GA-Q47	
C26	1.5			NP0-SI1.5	TCZ-1R5	Z004	NP0A-1R5	ZT-5515	5TCCB-V15	
C27	800									
C28	47			EF-00005	MFT-50					
C29	.5-3				829-3		3115-01-0R5	CT565A		
C30	5									
C31	10									
C32	.5-3				829-3		3115-01-0R5	CT565A		
C33	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C34	800									
C35	220			BPD-00022	DD-221	G051	811-221	UC-5322	5GA-T22	
C36	68			BPD-000068	DD-680	G038	811-680	UC-5468	5GA-Q68	
C37	470			BPD-00047	DD-471	K060	831-471	UC-5347	5GA-T47	
C38	800									
C39	800									
C40	82	500		1469-000082	TCZ-82	5R5Q82	NP0-337-820		MS-482	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA SENTINEL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C41	60	500		1469-00006	TCZ-62	5R5Q62	NP0-337-620		MS-46	
C42	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C43	820		23E4000-32	SI820	D6-821	K067	811-821		5GA-T82	
C44	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C45	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C46	820		23E4000-32	SI820	D6-821	K067	811-821		5GA-T82	
C47	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C48	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C49	820		23E4000-32	SI820	D6-821	K067	811-821		5GA-T82	
C50	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C51	680		23E4000-28	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C52	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C53	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C54	1000		23E4004-5	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C55	82	500		1469-000082	TCZ-82	5R5Q82	NP0-337-820		MS-482	
C56	8.2		23E4001-30	NP0-SI8.2		Z016	NP0A-8R2			
C57	6.8		23E4001-17	NP0-SI6.8	TCZ-6R8	TZ08	NP0A-6R8	ZT-5568	5TCCB-V68	
C58	220		23E4001-28	N750-SI220	TCN-220	TN30	NP0-335-221		5TCU-T22	
C59	.0015	400	23E3405	SI1500	D6-152	CUB6D15	GP2L-152	PT6215	6TM-D15	
C60	.0033	400	23E3407	SI3300	D6-332	CUB6D33	GP2-333-332	PT6233	6TM-D33	
C61	.1	400	23E3616	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C62	.01	600	23E3610	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C63	.01	600	23E3610	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C64	470	2000	23E4003-6	HVD-30-470	DD30-471	V2T47	3KV-471	DC30347	20GA-T47	
C65	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C66	10000		23E4004-17	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C67	.47	200	23E3220	P288N-47		CUB2P47		PT4047	2TM-P47	
C68	5.1		23E4001-16	NP0-SI5	TCZ-4R7	Z011	NP0A-050	ZT-555	5TCCB-V47	
C69	10		23E4001-18	NP0-SI10	TCZ-10	TZ09	NP0A-100	ZT-541	5TCC-Q1	
C70	10		23E4001-18	NP0-SI10	TCZ-10	TZ09	NP0A-100	ZT-541	5TCC-Q1	
C71	15		23E4001-19							
C72	5000		23E4004-15	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C73	47		23E4000-14	SI47	D6-470	TP29	GP1K-470	UC-5447	5GA-Q47	
C74	100	500	23E3500-32	1469-0001	D6-101	5R5T1	801-101	MCB235	MS-31	
C75	10000		23E4004-17	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C76	10000		23E4004-17	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C77	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C78	15		23E4001-19							
C79	220		23E4000-22	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C80	.1	400	23E3416	P488N-1	DF-104	CUB4P1		PT401	4TM-P1	
C81	.01	400	23E3410	BPD-01	DD-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C82	680		23E4000-28	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C83	.0047	400	23E3408	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C84	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C85	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C86	.047	600	23E3614	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C87	.0047	600	23E3608	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C88	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C89	330		23E4000-24	SI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	
C90	47		23E4000-14	SI47	D6-470	TP29	GP1K-470	UC-5447	5GA-Q47	
C91	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C92	.0022	400	23E3406	SI2200	D6-222	CUB6D22	GP2-333-222	PT6222	6TM-D22	
C93	.0047	400	23E3408	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C94	.0047	400	23E3408	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C95	.0047	400	23E3408	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C96	.1	600	23E3616	P688N-1	DF-104	CUB6P1		PT601	6TM-P1	
C97	.022	400	23E3412	BPD-02	DD-203	CUB4S22	817-02	PT4122	4TM-S22	
C98	.25	600	23E3618	P688N-25		CUB6P25		PT6025	6TM-P25	
C99	1000	1500	23E4003-7	HVD-15-1000	DD30-102	V2D1	1R5KV-102	DC3021	20GA-D1	
C100	.25	600	23E3618	P688N-25		CUB6P25		PT6025	6TM-P25	
C101	.001	400	23E3404	SI1000	D6-102	CUB6D1	GP2L-102	PT621	6TM-D1	
C102	.001	400	23E3404	SI1000	D6-102	CUB6D1	GP2L-102	PT621	6TM-D1	
C103	.0047	400	23E3408	SI4700	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C104	.047	600	23E3614	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C105	3900	500	23E4005-64	1464-0039		1R5D39		MCB463	MS-239	
C106	330	500	23E3500-77	1469-00033		5R5T33			MS-333	
C107	18		23E4001-25		TCZ-18	TZ12	NP0K-180			
C108	470	500	23E3500-40	1469-00047	D6-471	5R5T47	811-471	MCB245	MS-347	
C109	.01	600	23E3610	BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C110	.1	600	23E3616	P688N-1	DF-104	CUB6P1		PT601	6TM-P1	
C111	.22	600	23E622	P688N-22		CUB6P22		PT6022	6TM-P22	
C112	.25	600	23E622	P688N-25		CUB6P25		PT6025	6TM-P25	
C113	.25	1000	23E4006	P1089-25					PX-21	
C114	.047	600	23E3614	BPD-05	DF-503	CUB6S47		PT6147	6TM-S47	
C115	680		23E4000-28	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C116	.25	1000	23E4006	P1089-25					PX-21	
C117	.25	1000	23E4006	P1089-25					PX-21	
C118	.47	200	23E3220	P288N-47		CUB2P47		PT4047	2TM-P47	
C119	360	2500								
C120	360	2500								
C121	150			HVD-30-150	DD30-151	V3T15	3KV-151	DC30315	30GA-T15	
C122	1200	13000	23E2029-5							
C123	1200	15000	23E2029-5							
C124	500	12500								
C125	500	30000	23E2029-4	UV-503	TV8-503	MMU30T5			30DK-T5	
C126	10000		23E4004-17	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C127	82	500		1469-000082	TCZ-82	5R5Q82	NP0-337-820		MS-482	
C128	10		23E4001-18	NP0-SI10	TCZ-10	TZ09	NP0A-100	ZT-541	5TCC-Q1	
C129	120	500		1469-00012	TCZ-120	5R5T12	NP0-333-121		MS-312	
C130	100		23E4000-31	1469-0001	TCZ-100	TZ30	NP0-337-101	ZT-531	5TCC-T1	
C131	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C132	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C133	5000		23E4004-15	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C134	10000		23E4004-17	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C135	5000		23E4004-15	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C136	820	500	23E3500-45	1464-00082		1R5T82	811-821		MS-382	
C137	5000		23E4004-15	BPD-005	DD-502	K080	811-005	DC-525	5HK-D5	
C138	1.5-7		24E72		822-EZ		T52A-1.5	ST-5515-Z		
C139	15		23E4001-19							
C140	27		23E4001-26		TCN-27	TN08	N750K-270			
C141	120		23E4001-27	N750-SI120	TCN-120	TN-24	N750-337-121		5TCU-T12	
C142	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C143	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C144	.01	400	23E3410	BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C145	22		23E4001-29	NP0-SI22	TCZ-22	TZ14	NP0K-220		5TCC-Q22	

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP	RATING VOLT	REPLACEMENT DATA: SENTINEL PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C146	001	400	23E3404	SD300	D6-102	CUBSD-1	GP2L-102	PT621	5TM-D1	
C147	001	400	23E3404	SD300	D6-103	CUBSD-2	GP2L-103	PT631	5TM-D1	
C148	.01	400	23E3410	BPD-01	D6-103	CUBAS-1	GP3-333-103	PT4U	4TM-S1	
C149	.25	100	23E121	P268N-25		CUBP25		PT4025	68P1S	
C150	3		23E4001-34	NPO-6U1-2	TC2-2R2	TZ03	NPOA-2R2		5TCC-B-V22	
C151	10000		23E4004-17	BPD-01	DD-103	K082	81J-01	DC-5U	5HK-S1	
C152	5000		23E4004-15	BPD-005	DD-502	K080	81J-005	DC-525	5HK-D5	
C153	5000		23E4004-15	BPD-005	DD-502	K080	81J-005	DC-525	5HK-D5	
C154	82		23E4001-31	1469-000082	TCZ-4S2	TZ38	NPO-337-080		MS-4S2	
C155	01	400	23E3410	BPD-01	D6-103	CUBAS-1	GP3-333-103	PT4U	4TM-S1	
C156	001	400	23E3404	SD300	D6-102	CUBSD-1	GP2L-102	PT621	5TM-D1	
C157	5000		23E4004-15	BPD-005	DD-502	K080	81J-005	DC-525	5HK-D5	
C158	047	600	23E3504	BPD-05	DF-503	CUBS47		PT4147	47M-S47	
C159	22	400	23E3412	BPD-02	DD-303	CUBS22	81T-02	PT4122	47M-S22	
C160	022	400	23E3418	BPD-03	DD-303	CUBS22	81T-02	PT4122	47M-S22	
C161	22	400	23E3418	P488N-22		CUBP22		PT4022	47M-P22	
C162	1200	500	23E4005-58	1464-0022		UR5D22			MS-222	
C163	2200	500	23E4005-58	1464-0022		UR5D22			MS-222	
C164	2200	500	23E4005-58	1464-0022		UR5D22			MS-222	
C165	47	200	23E3220	P268N-47		CUBP47		PT4047	2TM-P47	
C166	047	600	23E3504	BPD-05	DF-503	CUBS47		PT6147	47M-S47	
C167	047	600	23E3514	BPD-05	DF-503	CUBS47		PT6147	67M-S47	

CONTROLS

ITEM No	RATING RESIST	RATING WATTS	REPLACEMENT DATA: SENTINEL PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No	INSTALLATION NOTES
R1A	500kΩ	1	28E133		RTV-580			Brightness (Panel)
B	1Meg	1						Volume & Switch tapped at 60kΩ and 40kΩ (Rear)
R2A	1Meg	1	28E136	B-69	A47-1Meg-S	QU-137	U-54	Tone
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A.
R3A	500Ω	1	28E137	F1-3				Contrast tapped at 135Ω (Panel)
B	2500Ω	1		R2-9				Chroma (Rear)
R4A	1Meg	1	28E146	F1-35		* QJ-1000	UF161	Vert. Hold (Panel)
B	Shaft	1		R1-23			UR141	Horiz. Hold (Rear)
R5A	500Ω	1	28E138	AB-5	A47-1000-S	QU-128	U-4	Blue Horiz. Amplitude
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R5A.
R6A	1000Ω	1	28E139	AB-5	A47-1000-S	QU-137	U-54	Green Horiz. Amplitude
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R6A.
R7A	1000Ω	1	28E136-2	AB-5	A47-1000-S	QU-128	U-4	Red Horiz. Amplitude
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	DS-26	Attach to R7A.
C	Coupler		Not Req.	Not Req.	Not Req.	C3	Not Req.	Attach to R7B.
R8A	1000Ω	1	28E140					Blue Vert. Tilt (Panel)
B	1000Ω							Blue Vert. Amplitude (Rear)
R9A	1000Ω	1	28E140					Green Vert. Tilt (Panel)
B	1000Ω							Green Vert. Amplitude (Rear)
R10A	1000Ω	1	28E140-2					Red Vert. Tilt (Panel)
B	1000Ω							Red Vert. Amplitude (Rear)
R11A	1Meg	1	28E142					Blue Screen (Panel)
B	500kΩ							Blue Background (Rear)
R12A	1Meg	1	28E142					Green Screen (Panel)
B	500kΩ							Green Background (Rear)
R13A	1Meg	1	28E143	AB-69	A47-1Meg-S	QU-137	U-54	Red Screen
B	Shaft		Not Req.	AK-4	KSS-5	C3	DS-36	Attach to R13A.
R14A	1Meg	1	28E145	AB-69	A47-1Meg-S	QU-137	U-54	Vert. Size
B	Shaft		Not Req.	AK-4	KSS-3	Not Req.	Not Req.	Attach to R14A.
R15A	1000Ω	3	28E.44		A43-1000	WPK-1000	K1000L	Vert. Linearity-WireWound
B	Shaft		Not Req.		KSS-3	Not Req.	Not Req.	Attach to R15A.
R16A	1Meg	1	28E165					Color Gate (Panel)
B	500kΩ							AGC (Rear)
R17A	300Ω	2	28E147					Vert. Centering (wire wound) (Panel)
B	300Ω	2						(Rear Panel)
R18A	100Ω	2	28E148					Horiz. Centering(wire wound) (Panel)
B	100Ω	2						(Rear Panel)
R19A	5000Ω	1	28E149	AB-10	A47-500Ω-S	QU-114	U-14	Horiz. Drive
B	Shaft		Not Req.	AK-1	FKS-1	Not Req.	Not Req.	Attach to R19A.
R20A	50kΩ	1	28E135	AB-59	A47-500K-S	QU-133	SU-50	High Voltage
B	Shaft		Not Req.	AK-1	FKS-1	RQ	Not Req.	Attach to R20A.
R21	5Meg	1	28E134					Bezel
R22	600Ω with 100Ω stop	1	28E122		* 39-500			Buss Wire Wound

* Connect a 100Ω resistor in series with the terminal and the lead connecting to the same terminal of the control.
Concentrikit Equivalent. R-15 Kit, Base Elements and Shafts; Bil-137 & P17-024 (Panel)
Bil-116 & Ri-108 (Rear)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA: SENTINEL PART No	IRC PART No	NOTES
R33	22kΩ	1	27E223K-½	BTS-22K	
R34	47kΩ	1	27E473K-½	BTS-47K	
R35	12Ω	1	27E120K-½	BTS-22	
R36	330kΩ	1	27E334K-½	BTS-330K	
R37	470kΩ	1	27E474K-½	BTS-470K	
R38	47Ω	1	27E47K-½	BTS-470	
R39	10kΩ	1	27E103K-½		
R40	3300Ω	1	27E332K-½		
R41	6800Ω	1	27E682K-½		
R42	100kΩ	1	27E104K-½		
R43	100kΩ	1	27E104K-½		
R44	22kΩ	1	27E223K-½		
R45	5kΩ	1	27E.51K-½		
R46	8200Ω	1	27E822K-½	BTS-8200	
R47	10kΩ	1	27E103K-½	BTS-10K	
R48	.05Meg 5%	1	27E.05J-½	BTS-.05Meg 5%	
R49	1Meg 5%	1	27E105J-½	BTS-1.0Meg 5%	
R50	470kΩ 5%	1	27E474J-½	BTS-470K 5%	
R51	4700Ω	1	27E472J-½	BTS-4700	
R52	47kΩ	1	27E473K-½	BTS-47K	
R53	4700Ω	1	27E472K-½	BTS-4700	
R54	47kΩ	1	27E473K-½	BTS-47K	
R55	2700Ω	1	27E272K-½	BTA-2700	
R56	56Ω	1	27E560K-½	BTS-56	
R57	4700Ω	1	27E472K-½		
R58	470Ω	1	27E471K-½	BTS-470	
R59	330Ω	1	27E331K-½	BTS-330	
R60	10kΩ	1	27E103K-½	BTS-10K	
R61	4100Ω 1%	1	27E.027-4		
R62	39kΩ	1	27E393K-½	BTS-39K	
R63	33kΩ	1	27E333K-½	BTS-33K	
R64	6500Ω	10	27E1022-2		
R65	120kΩ	1	27E124K-½	BTA-120K	
R66	2200Ω	1	27E222K-½	BTS-2200	
R67	.5kΩ	2	27E153K-2	BTS-.5K	
R68	19kΩ	1	27E192K-2	BTS-1900	
R69	560Ω	1	27E561K-½	BTS-560	
R70	470	1	27E470K-½	BTS-47	
R71	220kΩ	1	27E224M-½	BTS-220K	
R72	270kΩ	1	27E274M-½	BTS-270K	
R73	130kΩ 5%	1	27E1242-½	BTS-56K 5%	
R74	56kΩ	1	27E563K-½	BTS-56K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA: SENTINEL PART No	IRC PART No	NOTES
R75	33kΩ	1	27E333K-½	BTS-33K	
R76	10kΩ	1	27E103K-½	BTS-10K	
R77	4700Ω 5%	1	27E472J-½	BTS-4700 5%	
R78	100kΩ	1	27E104K-½	BTS-100K	
R79	33kΩ	2	28E333K-2	BTS-33K	
R80	47kΩ	1	27E473K-½	BTS-47K	
R81	33kΩ	2	28E333K-2	BTS-33K	
R82	22kΩ	½	27E223K-½	BTS-22K	
R83	680Ω	1	27E681K-½	BTS-680	
R84	220kΩ	1	27E224K-½	BTS-220K	
R85	220Ω	1	27E224K-½	BTS-220	
R86	33kΩ	1	27E333K-½	BTA-33K	
R87	1Meg	1	27E105K-½	BTS-1Meg	
R88	47kΩ	1	27E473K-½	BTS-47K	
R89	27kΩ	1	27E273K-½	BTS-27K	
R90	6.7Meg	1	27E675M-½	BTS-6.7Meg	
R91	330kΩ	1	27E334M-½	BTS-330K	
R92	220Ω	1	27E221K-½	BTS-220	
R93	1500Ω	1	27E152K-½	BTS-1500	
R94	470kΩ	1	27E474K-½	BTS-470K	
R95	3000Ω	10	27E1015-28	PWD-3000	
R96	4700Ω	1	27E472K-½	BTS-4700	
R97	270Ω	1	27E271K-½	BTA-270	
R98	470kΩ	1	27E474M-½	BTS-470K	
R99	2.7Meg	1	27E275K-½	BTS-2.7Meg	
R100	100kΩ	1	27E104K-½	BTS-100K	
R101	10kΩ	½	27E103K-½	BTS-10K	
R102	39kΩ	½	27E393K-½	BTS-39K	
R103	1Meg	1	27E105K-½	BTS-1Meg	
R104	4700Ω	1	27E472K-½	BTS-4700	
R105	1000Ω	½	27E102K-½	BTS-1000	
R106	3900Ω	1	27E392K-½	BTS-3900	
R107	22kΩ	1	27E223K-½	BTS-22K	
R108	8200Ω	1	27E822K-½	BTS-8200	
R109	8200Ω	1	27E822K-½	BTS-8200	
R110	1Meg	1	27E105K-½	BTS-1Meg	
R111	1Meg	1	27E105K-½	BTS-1Meg	
R112	470kΩ	1	27E474K-½	BTS-470K	
R113	270kΩ	1	27E274M-½	BTS-270K	
R114	1Meg	1	27E105K-½	BTS-1Meg	
R115	1Meg	1	27E105K-½	BTS-1Meg	
R116	8200Ω	1	27E822K-½	BTS-8200	
R117	100Ω	1	27E101K-½	BTS-100	
R118	2.2Meg	1	27E225K-½	BTS-2.2Meg	
R119	330Ω	1	27E331K-½	BTA-330	
R120	100Ω	1	27E101K-½	BTS-100	
R121	220Ω	2	27E221K-2	BTS-220	
R122	120Ω		27E121K-½		
R125	680kΩ		27E684M-½	BTS-680K	
R126	6.7Meg		27E675M-½	BTS-6.7Meg	
R127	120kΩ 5%		27E124J-½	BTS-120K 5%	
R128	120kΩ 5%		27E124J-½	BTS-120K 5%	
R129	470kΩ		27E474M-½		
R130	5000Ω 5%		27E502J-½		
R131	100kΩ 5%		27E104J-½		
R132	120kΩ		27E124J-½		
R133	18000Ω 5%		27E182J-½		
R134	470Ω		27E474K-½	BTS-470	
R135	680Ω		27E682K-½		
R136	100Ω		27E101K-½		
R137	470kΩ		27E474K-½		
R138	100Ω		27E101K-½		
R139	12kΩ	10	27E1016-29	1 3AA-12K	
R140	4700Ω	1	27E472K-½		
R141	10kΩ		27E103K-½		
R142	1000Ω		27E102K-½		
R143	10kΩ		27E103K-½		
R144	2.7Meg	3	27E1027		
R145	8.6Meg	3	27E1027-2		
R146	50Meg	3	27E1027-3		
R147	1.2Meg		27E125K-½		
R148	1.5Meg		27E155M-½		
R149	1000Ω		27E102K-½		

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA: SENTINEL PART No	IRC PART No	NOTES
R150	10kΩ	1	27E103K-½		
R151	12kΩ	1	27E123K-½		
R152	1000Ω	1	27E102K-½	BTS-1000	
R153	68kΩ	1	27E683K-½	BTA-68K	
R154	12kΩ	1	27E123K-½	BTS-12K	
R155	120kΩ	1	27E124K-½	BTS-120K	
R156	5600Ω	1	27E562K-½	BTS-5600	
R157	18kΩ	1	27E183K-½	BTS-18K	
R158	1000Ω	1	27E102K-½	BTS-1000	
R159	100Ω	1	27E101K-½	BTS-100	
R160	560kΩ	1	27E564K-½	BTS-560K	
R161	560Ω	1	27E561K-½	BTS-560	
R162	10kΩ	1	27E103K-½	BTS-10K	
R163	680Ω	1	27E681K-½	BTS-680	
R164	1000Ω	1	27E102K-½	BTS-1000	
R165	470Ω	1	27E471K-½	BTA-470	
R166	15kΩ	1	27E153K-½	BTA-15K	
R167	3500Ω	6	27E3016-5	PWT-3500	
R168	220Ω	1	27E221K-½	BTA-220	
R169	2.2Meg		27E225K-½	BTS-2.2Meg	
R170	1Meg 5%	1	27E105J-½	BTS-1Meg 5%	
R171	1Meg 5%	1	27E105J-½	BTS-1Meg 5%	
R172	15kΩ	1	27E153K-½	BTS-15K	
R173	2.2Meg 5%	1	27E225J-½	BTS-2.2Meg 5%	
R174	22Meg 5%	1	27E226J-½	BTS-22Meg 5%	
R175	2.2Meg 5%	1	27E225J-½	BTS-2.2Meg 5%	
R176	20Meg 5%	1	27E206J-½	BTS-20Meg 5%	
R177	220kΩ	1	27E224K-½	BTS-220K	
R178	2200Ω	1	27E222K-½	BTS-2200	
R179	560Ω	1	27E561K-½	BTS-560	
R180	2700Ω 5%	1	27E272J-½	BTS-2700 5%	
R181	330kΩ	1	27E334M-½	BTS-330K	
R182	100kΩ	1	27E104K-½	BTS-100K	
R183	560Ω	1	27E561K-½	BTS-560	
R184	10kΩ	1	27E103K-½	BTS-10K	
R185	10kΩ	1	27E103K-½	BTS-10K	
R186	3900Ω 5%	1	27E392J-½		
R187	82000Ω 5%	1	27E8222-2		
R188	560Ω	1	27E561K-2		
R189	56kΩ	1	27E563J-2	BTB-56K	
R190	22kΩ 5%	2	27E2232-2	BTB-22K 5%	
R191	10kΩ	1	27E103K-½	BTS-10K	
R192	62kΩ 5%	2	27E623J-2	BTB-62K 5%	
R193	82kΩ 5%	2	27E823J-2	BTB-82K 5%	
R194	68kΩ	1	27E683K-½	BTS-68K	
R195	120kΩ 5%	1	27E124J-½	BTS-120K 5%	
R196	56kΩ	1	27E563K-½	BTS-56K	
R197	390kΩ 5%	1	27E394J-½	BTS-390K 5%	
R198	82kΩ	1	27E823K-½	BTS-82K	
R199	82kΩ	1	27E823K-½	BTS-82K	
R200	270kΩ	1	27E274M-½	BTS-270K	
R201	6800Ω	1	27E682K-2	BTB-6800	
R202	100kΩ	1	27E104K-½	BTS-100K	
R203	2700Ω 5%	1	27E272J-½	BTS-2700 5%	
R204	100kΩ	1	27E104K-½	BTS-100K	
R205	2700Ω 5%	1	27E272J-½	BTS-2700 5%	
R206	100kΩ	1	27E104K-½	BTS-100K	
R207	2700Ω 5%	1	27E272J-½	BTS-2700 5%	
R208	560kΩ	1	27E564K-½	BTS-560K	
R209	560kΩ	1	27E564M-½	BTS-560K	
R210	560kΩ	1	27E564M-½	BTS-560K	
R211	470kΩ	1	27E474K-½	BTS-470K	
R212	330kΩ	1	27E334M-½	BTS-330K	
R213	56kΩ	2	27E563J-2	BTB-56K	
R214	56kΩ	2	27E563K-2	BTB-56K	
R215	56kΩ	2	27E563K-2	BTB-56K	
R216	56kΩ 5%	2	27E563J-2	BTB-56K 5%	
R217	1000Ω	1	27E102K-½	BTS-1000	
R218	100Ω	1	27E101K-½	BTS-100	
R219	1000Ω	1	27E102K-½	BTS-1000	
R220	100kΩ	1	27E104K-½	BTS-100K	
R221	10Ω	1	27E100K-½	BTS-10Ω	
R222	56kΩ	1	27E563K-½	BTS-56K	

TRANSFORMER (POWER)

ITEM No	RATING PRI	RATING SEC 1	RATING SEC 2	RATING SEC 3	REPLACEMENT DATA: SENTINEL PART No	Halloran PART No	Merit PART No.	Stancor PART No	Thordarson PART No.	Triad PART No
T1	115VAC @ 3.55A	185V Tap @ 105V @ 510A	@ 14.2A	6.3A @ 1.8A	22E110					

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: SENTINEL PART No	Halloran PART No	Merit PART No	RCA TYPE No.	Ram PART No	Stancor PART No	Thordarson PART No.	Triad PART No.
T2	Vert. Osc. Trans.	22E106	B6702	A-3003	209T1 ①	V405	A-8135	26A03	A-97X
T3	Horiz. Output Trans.	20K1107				V307	A-8144	26B72	A-108X
T4	Vert. Output Trans.	22E108	Z1900 ②	A-2623					
T5A	Yoke-Horiz. (12MH)	20E1174 ⑥							
B	Vert. (205MH)								
T6	Horiz. Lin. Coil (.2-1.64MH)			RF804 ①	MWC-2	206R1 ①	20R14 ①	WC-7①	WC-23	WC-12⑬⑭
T7	Width Coil (.2-1.64MH)	20E1116		RF804 ①		206R1 ①	20R14 ①	WC-7①	WC-23	WC-12⑬⑭
T8	Horiz. AFC Pulse Trans.									
T9	Vert. Centering Choke	22E107								
T10	Horiz. Centering Choke (4-18MH)	20E1116		RF804 ① ⑥	MWC-11①	212R1⑬⑭	20R18⑬⑭	WC-5⑬⑭	WC-18④	WC-13⑬ ⑭
T11	Horiz. Centering Choke	20E1117								
T12	Horiz. Convergence Phase Coil (.4-1.64MH)	20E1223		RF804 ①	MWC-2	206R1 ①	20R14 ①	WC-7	WC-23	WC-12 ⑬⑭
T13A	Green) Dynamic	20E1175 ⑦								
B	Blue) Convergence									
C	Red) Yoke Assy.									

TRANSFORMERS (SWEEP CIRCUITS) (cont)

ITEM No.	USE	REPLACEMENT DATA: SENTINEL PART No	Halloran PART No	Merit PART No	RCA TYPE No.	Ram PART No	Stancor PART No	Thordarson PART No.	Triad PART No.
T14	Dynamic Convergence Inductor Assy.	20E1102							

① Drill new mounting hole(s).
② Use 8 to 1 turns ratio.
③ Use red and blue terminals.
④ Adjust to maximum inductance.
⑤ Use terminals #1 and #2.
⑥ Includes capacitors C119, C120 and C121, resistors R122, R123 and R140.
⑦ Includes control magnet, Sentinel part #P-1080 (5 used).

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI	IMPEDANCE SEC	REPLACEMENT DATA: SENTINEL PART No.	Halloran PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T15	6KΩ	3-4Ω	22E102	Z1006 ①	A2935 ②	A3830	22B58	S-5X	① Drill One New Mounting Hole ②Tape Up Center Tap

SPEAKER

ITEM No.	RATINGS SIZE	FIELD	V. C. IMP	REPLACEMENT DATA: SENTINEL PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	10"	PM	3-4Ω	1E43-4	10A31	23S81	
SP2	5"	PM	3-4Ω	1E56-3	5A07	20S82	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: SENTINEL PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1A	Ant. Coil	0Ω CT	0Ω	31M-013-3UC				Channel 2
B	Ant. Coil	0Ω CT	0Ω	31M-012-3UC				Channel 3
C	Ant. Coil	0Ω CT	0Ω	31M-012-4UC				Channel 4
D	Ant. Coil	0Ω CT	0Ω	31M-012-5UC				Channel 5
E	Ant. Coil	0Ω CT	0Ω	31M-012-6UC				Channel 6
F	Ant. Coil	0Ω CT	0Ω	31M-012-7UC				Channel 7
G	Ant. Coil	0Ω CT	0Ω	31M-012-8UC				Channel 8
H	Ant. Coil	0Ω CT	0Ω	31M-012-9UC				Channel 9
I	Ant. Coil	0Ω CT	0Ω	31M-012-10UC				Channel 10
J	Ant. Coil	0Ω CT	0Ω	31M-012-11UC				Channel 11
K	Ant. Coil	0Ω CT	0Ω	31M-012-12UC				Channel 12
L	Ant. Coil	0Ω CT	0Ω	31M-012-13UC				Channel 13
L2	Neut. Coil	0Ω						
L3A	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-3UC				Channel 2
B	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-3UC				Channel 3
C	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-4UC				Channel 4
D	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-5UC				Channel 5
E	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-6UC				Channel 6
F	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-7UC				Channel 7
G	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-8UC				Channel 8
H	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-9UC				Channel 9
I	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-10UC				Channel 10
J	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-11UC				Channel 11
K	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-12UC				Channel 12
L	RF, Mixer Grid & Osc. Coils	0Ω		31M-112-13UC				Channel 13
L4	Fil. Choke	0Ω						
L5	Conv. Plate	.1Ω						
L6	47.25MC Trap	0Ω		20K1093				
L7	41.25MC Trap	0Ω		20K1084				Tapped
L8	1st. Video IF			20K1085				Tapped
L9	Fil. Choke	0Ω		20K1082				Tapped
L10	2nd. Video IF	.1Ω	.1Ω	20K1080	19-1001	17-4523	4604	1.5Ω
L11	Fil. Choke	0Ω		20K1092	19-1001	TV-130	6249	
L12	3rd. Video IF	.1Ω	.1Ω	20K1081	19-1001	17-4523	4604	1.5Ω
L13	Fil. Choke	0Ω		20K1092	19-1001	TV-130	6294	
L14	Fil. Choke	0Ω		20K1092	19-1001		4604	1.5Ω
L15	4th. Video IF	.1Ω	.1Ω	20K1185	17-4534	TV-130	4604	1.5Ω
L16	Fil. Choke	0Ω		20K1092	19-1001		6249	
L17	RF Coil	3.3Ω			19-1006		4604	1.5Ω
L18	Luminance Detector	.2Ω		30E1082			4612	11 Microhenries
L19	41.25MC Trap	0Ω		20K1088				Includes (2) series peaking coils, 33Ω resistor and trap
L20	Series Peaking Coil	10Ω		20K1089				Tapped
				20E1263-13	19-4301 ⑧		6154 ⑧	210 Microhenries; wound on 15KΩ resistor
L21	Series Peaking Coil	10.3Ω		30K1108				
L22	4.5MC Trap	.85CT		30K1109				180 Microhenries
L23	Shunt Peaking Coil	10.5Ω		20K1092				330 Microhenries, wound on 10Meg resistor
L24A	Series Peaking Coil	7.8Ω		20K1186				455 Microhenries
B	Shunt Peaking Coil	6.3Ω						400 Microhenries

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: SENTINEL PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L25	Shunt Peaking Coil	27Ω		20E363-6	19-5100		4642 ▲	1070 Microhenries, wound on 1Meg resistor
L26	RF Choke	2.3Ω			19-1005		4612	11 Microhenries
L27	Series Peaking Coil	.9Ω		20E1086				5.7 Microhenries
L28	1st. Sound IF	4.2Ω		20E1088				
L29	2nd. Sound IF	.6Ω	.6Ω	20E1036				
L30	Quadrature Coil	4.6Ω		20E1037			1470	
L31	4.5MC Trap	1Ω CT		20E1090				
L32A	4.5MC Trap	4.8Ω		20E1091				
B	4.1MC Trap	.8Ω						
L33	Shunt Peaking Coil	27Ω		20E363-6			4642 ▲	1070 Microhenries, wound on 1Meg resistor
L34	Chroma Interstage Transformer	5.5Ω	1.9Ω	20E1103				
L35	2nd. Chroma Amplifier Plate Coil	15Ω		20E1110				
L36	7.2MC Trap	2.8Ω		20E1140				
L37	Burst Take-off Coil	1.8ΩCT		20E1112				Includes 10KΩ resistor
L38	Series Peaking Coil	3.8Ω		20E1087				Wound on 1Meg Resistor
L39	Shunt Peaking Coil	27Ω		20E363-6			4642 ▲	1070 Microhenries, wound on 1Meg resistor
L40	Chroma Reference Osc. Plate Coil	2.9Ω	.6Ω	20E1105				Tertiary winding#1-.4Ω Tertiary winding#2-.7Ω
L41	Phase Shift Coil	1.1ΩCT		20E1115				
L42	Demodulator Driver Trans.	3.2Ω	3.2Ω *	20E1104				* Tapped @ 2.3Ω
L43	Series Peaking Coil	14Ω		20E1111	19-4950		4652	1010 Microhenries
L44	Series Peaking Coil	14Ω		20E1111	19-4950		4652	1010 Microhenries
L45	Series Peaking Coil	14Ω		20E1111	19-4950		4652	1010 Microhenries
L46	RF Choke	2.3Ω			19-1005		4612	11 Microhenries
L47	RF Choke	1.1Ω			19-6033	TV-180	6176	33 Microhenries

■ Parallel with 15KΩ resistor.
▲ Parallel with 1Meg resistor.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: SENTINEL PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	RCA TYPE No.	Ram PART No.	Thordarson PART No.	NOTES
L48	97Ω		20E831	19-1576	TV-163	6210			HS-5	

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA: SENTINEL PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L49	.400A	38Ω	1.1HY	22E109					
L50	.110A	38Ω	1.1HY	22E109	C5040 ①	C2974	C2327 ①	26C41 ①	C2LX

① Drill one new mounting hole.

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: SENTINEL PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.400ADC	57E16-2C			8S500		509	
M2	.510ADC	57E16-3C			9S750		609	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA: SENTINEL PART No. FUSE	SENTINEL PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M3	1" Piece #26 Wire							
M4	2"Piece #26 Wire							
M5	N	4/10A 125V	40E7-6		333.400 (N 4/10A)	346009	N 4/10	HN 3/10-1/2
M6	N	5A 125V	40E8-12	55E57	333005. (N5A)	346019	N5	HN3½-5

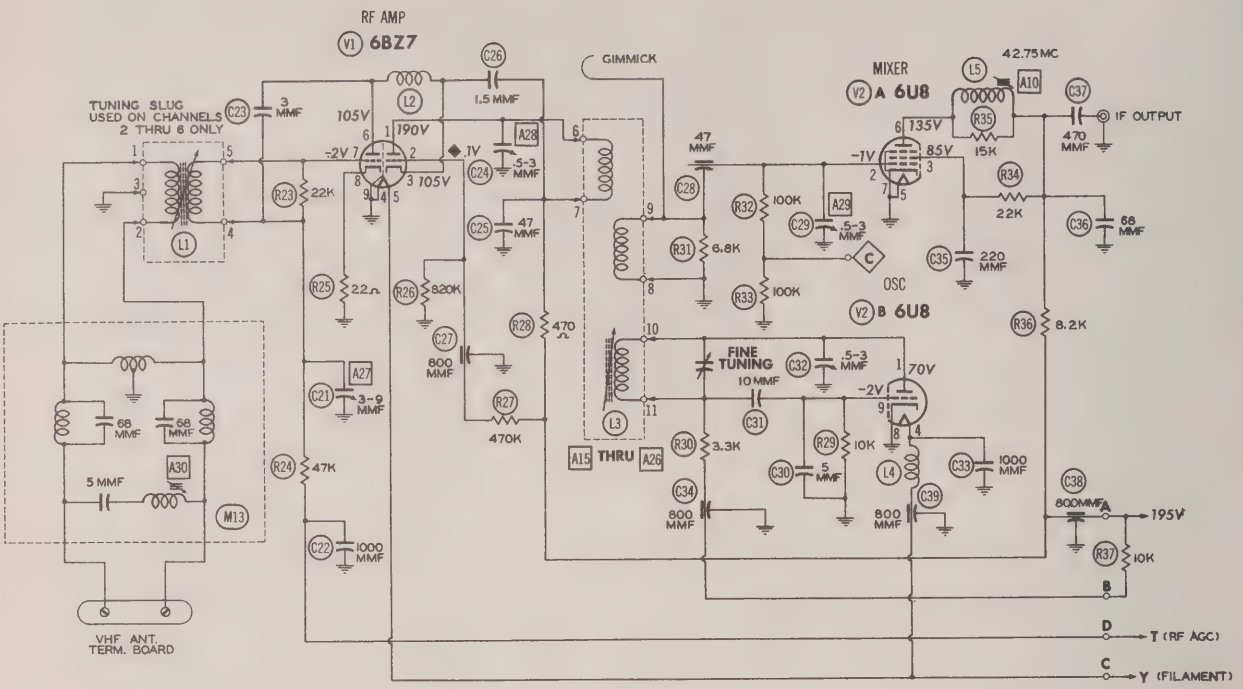
CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA: SENTINEL PART No.	REPLACEMENT DATA: SYLVANIA PART No.	NOTES
M7	CK-706A	CK-706A	1N60	Video Det. (Pigtail)
M8	CK-706A	CK-706A	1N60	Sound & Chroma Det. (Pigtail)
M9	1N67	1N67	1N67	Chroma Bias Clamper (Pigtail)

PARTS LIST AND DESCRIPTIONS (Continued)

MISCELLANEOUS

ITEM No.	PART NAME	SENTINEL PART No.	NOTES
M10	Dial Light	40E2	#44
M11	Tuner	20E1079	
M12	Variable Cap.	24E69	Hue Control (Air Trimmer: 5-25MMF.)
M13	Trap	31K-225-816C	VHF Ant. Input Filter.
M14	Delay Line	20E1119	Luminance Channel.
M15	3.579545 MC Osc. Assembly	20E1114	Includes Coil, Capacitor, & 3.58MC Crystal (Crystal Part #95E3-2).
M16	Magnet	62E11	Blue Beam Lateral Corrector.
M17	Magnet	62E10	Purity
M18	Magnet	P-1081	Picture Tube Rim Purity (8 Used).
M19	Connector	20E1197	High Voltage - Includes 3-22KΩ High Voltage Filter Resistors
	Trimmer Cap.	24E71	Neutralizing (50-380MMF.).
	Trimmer Cap.	24E70	Red Horiz. Tilt (50-380MMF.).
	Trimmer Cap.	24E70	Green Horiz. Tilt (50-380MMF.).
	Trimmer Cap.	24E70	Blue Horiz. Tilt (50-380MMF.).
	Knob	37E89	Fine Tuning.
	Knob	37E90-5	Channel Selector.
	Knob	37E113	Hue & Tone.
	Knob	37E113-2	Horiz. Hold & Chroma.
	Knob	37E114	Vertical Hold & Contrast.
	Knob	37E86-5	Brightness
	Knob	37E85-7	On-Off-Volume.
	Safety Glass	9E45-16	
	Mask	36E106	



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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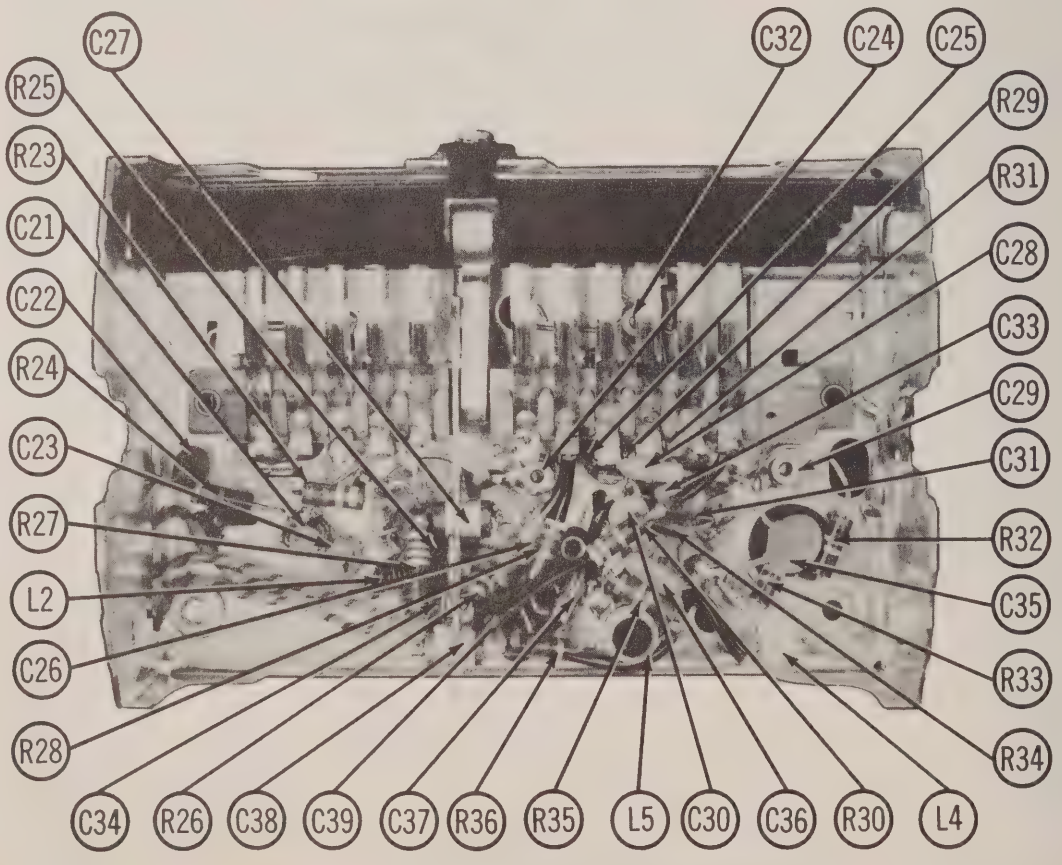
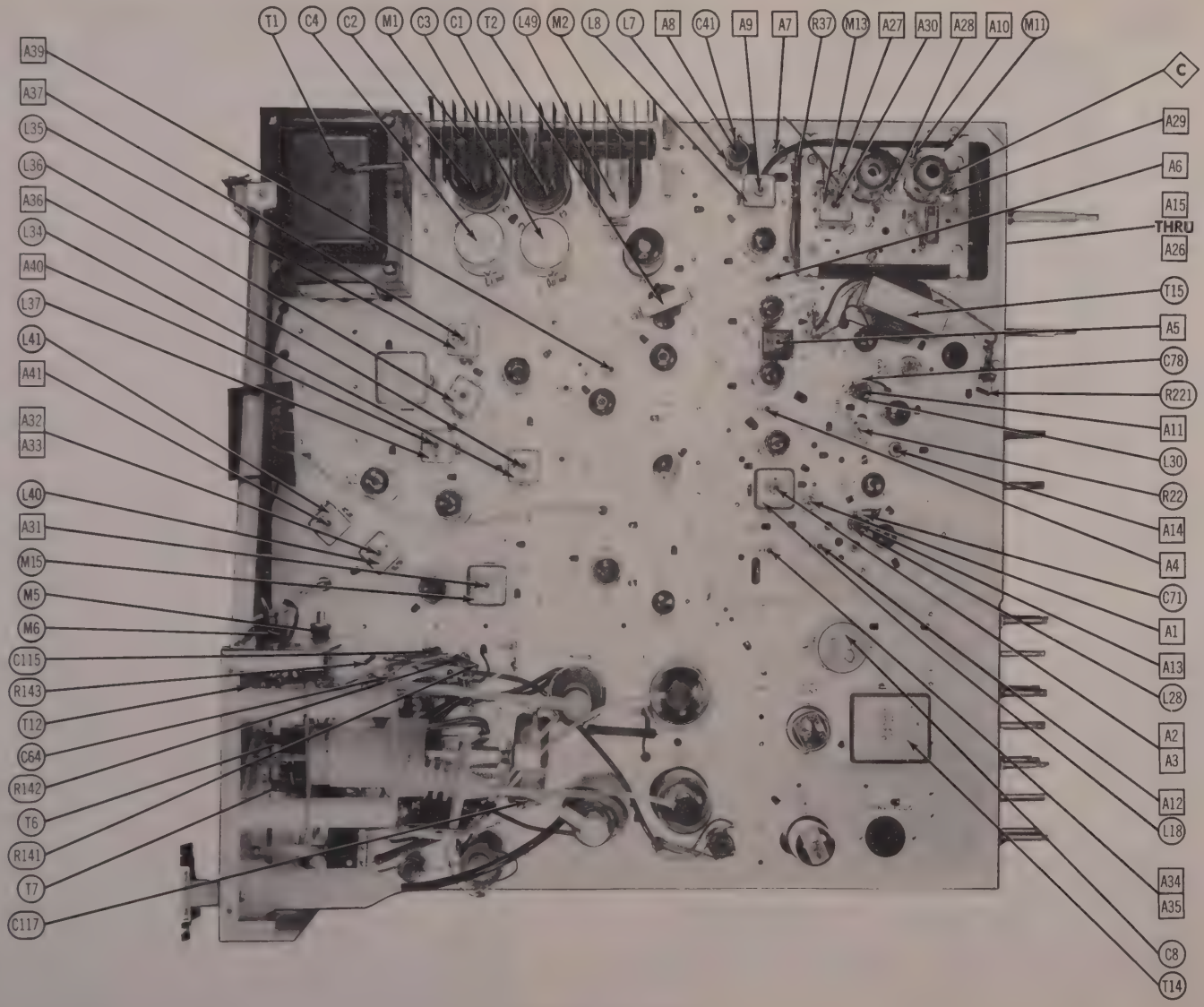
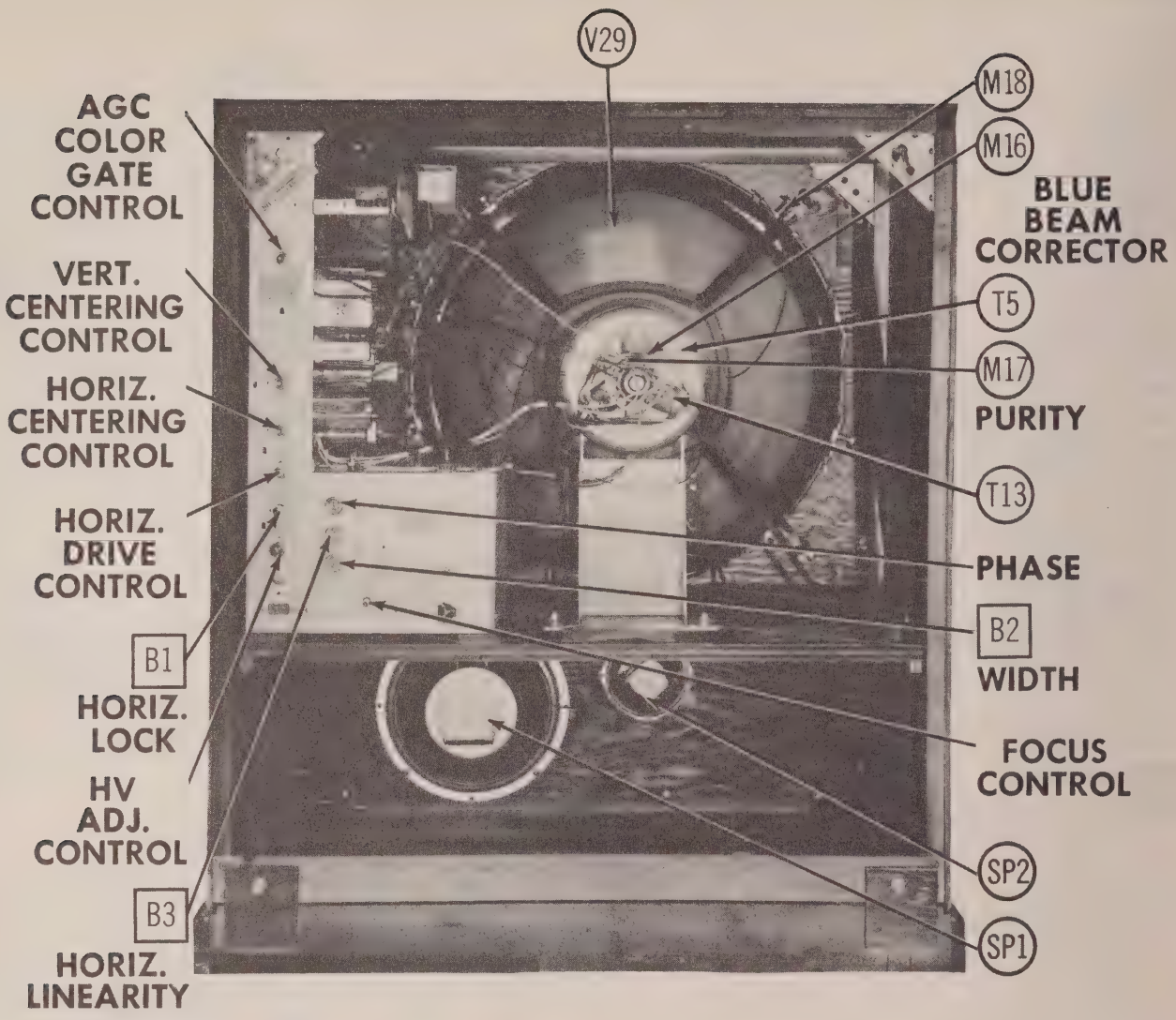
TUNER SCHEMATIC



RF TUNER-BOTTOM VIEW



CHASSIS TOP VIEW



CABINET—REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 10 push-on type control knobs from front panel of cabinet.

2. Remove 14 wood screws. Remove rear cover.

3. Remove picture tube socket, yoke plug, HV lead, speaker leads, convergence plug and ground lead.

4. Remove 4 wood screws from corner bracket at the upper left corner of cabinet.

5. Remove 3 chassis bolts. Remove chassis.

CABINET SHELL REMOVAL

1. Remove 14 wood screws. Remove rear cover.

2. Remove 2 screws located at the lower front sides of the cabinet (one on each side of cabinet).

3. Remove the top screw of each cabinet shell retaining bracket located at the lower rear of cabinet.

4. Remove cabinet shell by lifting straight up.

SPEAKER REMOVAL

1. Remove speaker leads at audio output transformer.

2. Remove 4 hex nuts from large speaker and 2 hex nuts from small speaker.

3. Remove speakers from cabinet.

PICTURE TUBE REMOVAL

1. Remove cabinet shell as outlined under "Cabinet Shell Removal" and chassis as outlined under "Chassis Removal".

2. Remove the blue horizontal corrector magnet, purity magnet, convergence yoke assembly and complete yoke assembly including brackets.

3. Remove the safety glass panel assembly. Panel is held by 4 nuts located inside cabinet front.

4. Place cabinet face down on a soft surface.

5. Remove the picture tube harness assembly and insulating shield.

6. Before removing the picture tube, make note of the position of the edge magnets, HV connector, banding around tube and the depth in which picture tube is seated in cabinet. The picture tube, banding and edge magnet assembly are removed from the cabinet as a unit.

7. Remove picture tube assembly from cabinet.

8. Remove edge magnet assembly and the insulating band around picture tube.

PHOTOFACT* Folder

*TRADE MARK

SETCHELL-CARLSON 56, 56-WR, 561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)

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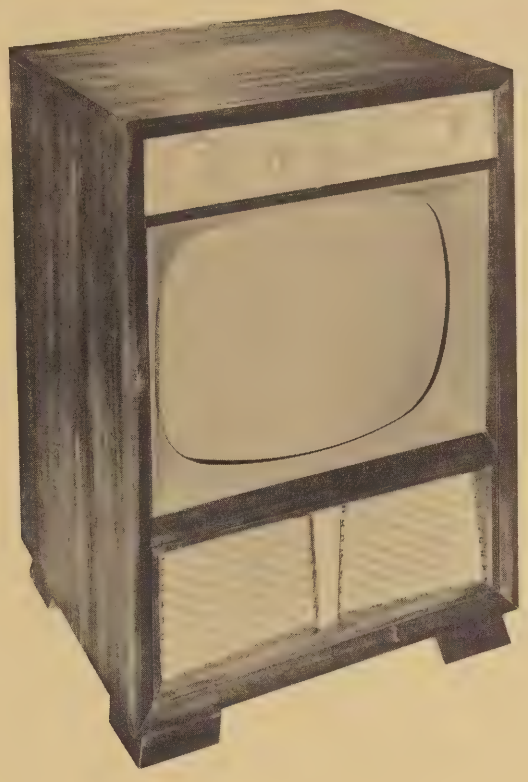

SETCHELL-CARLSON MODEL 563

TRADE NAME	Setchell-Carlson Models 56, 56-WR, 561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)
MANUFACTURER	Setchell-Carlson, Inc., New Brighton, Minn.
TYPE SET	Television Receiver
TUBES	Twenty-eight
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.88 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 48.75MC, Sound IF 44.25MC (Intercarrier)

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SETCHELL-CARLSON 56, 56-WR, 561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)

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L. F. BLANKENSHIP
3921 MEADE ST.
DENVER, COLORADO

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DISASSEMBLY INSTRUCTIONS

The top panel of the cabinet may be opened for servicing of tubes and/or unit replacement. Remove 3 hex head bolts from the top part of the control panel.

CHASSIS REMOVAL

1. Remove 9 push-on type control knobs from front panel of cabinet.

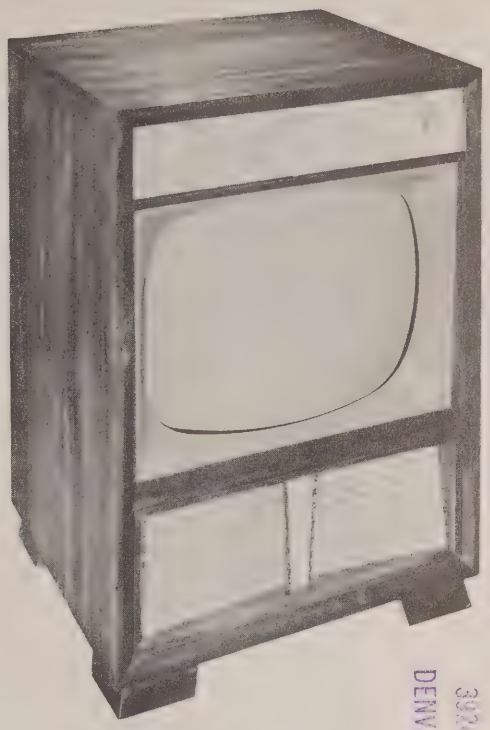
2. Remove 14 wood screws. Remove rear cover.

3. Remove 2 wood screws holding antenna terminal bracket.

4. Remove picture tube socket, yoke plug, HV lead , speaker plug and radio antenna leads.

5. Remove 2 chassis bolts. Remove chassis.

6. Remove 4 speaker nuts. Remove 2 speakers.



MODELS	CHASSIS
56, 56-WR, 561, 562, 563, 5601, 5602, 5603	156-RP

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SETCHELL-CARLSON 56, 56-WR,
561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 3 wood screws holding wooden molding at the top edge of the safety glass. Remove molding and safety glass. Use extreme caution when removing safety glass.

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjust the horizontal hold control to synchronize the picture horizontally. If the horizontal hold control will not synchronize the picture, replace V20 (12AU7A).

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L24) located on top of the chassis.

FUSES

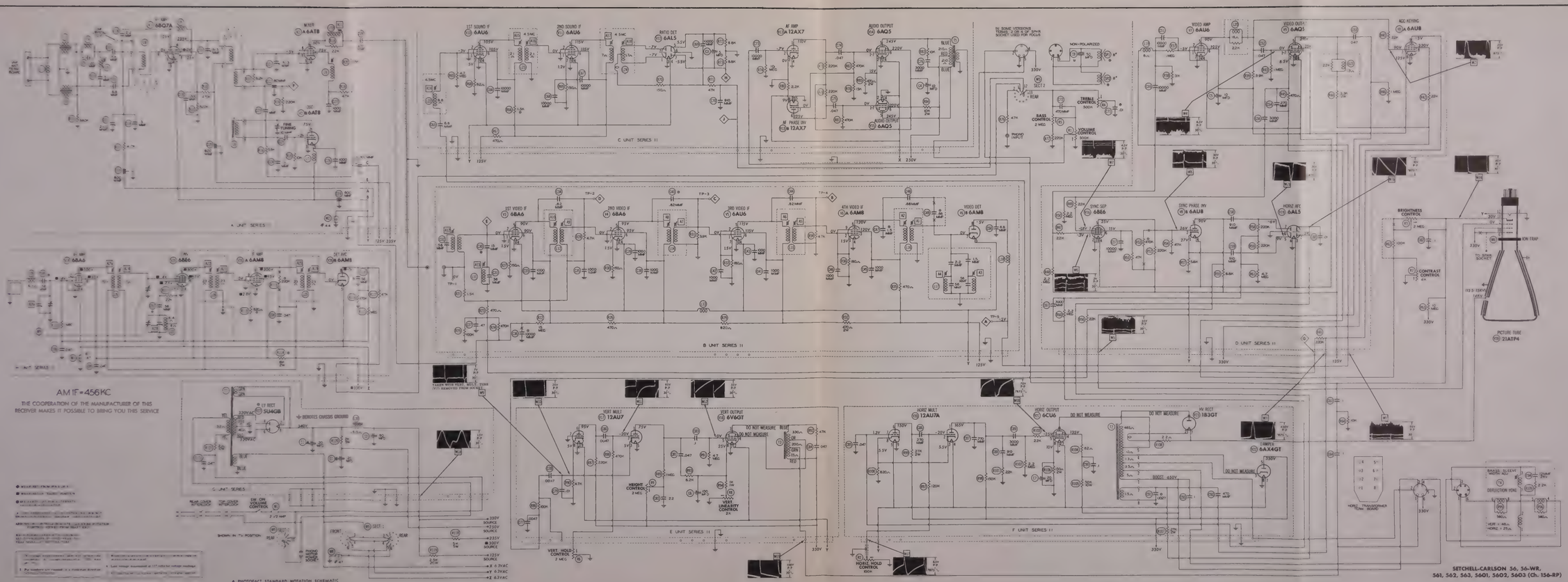
One fuse is used for LV power supply protection. For location see tube placement chart.

CENTERING

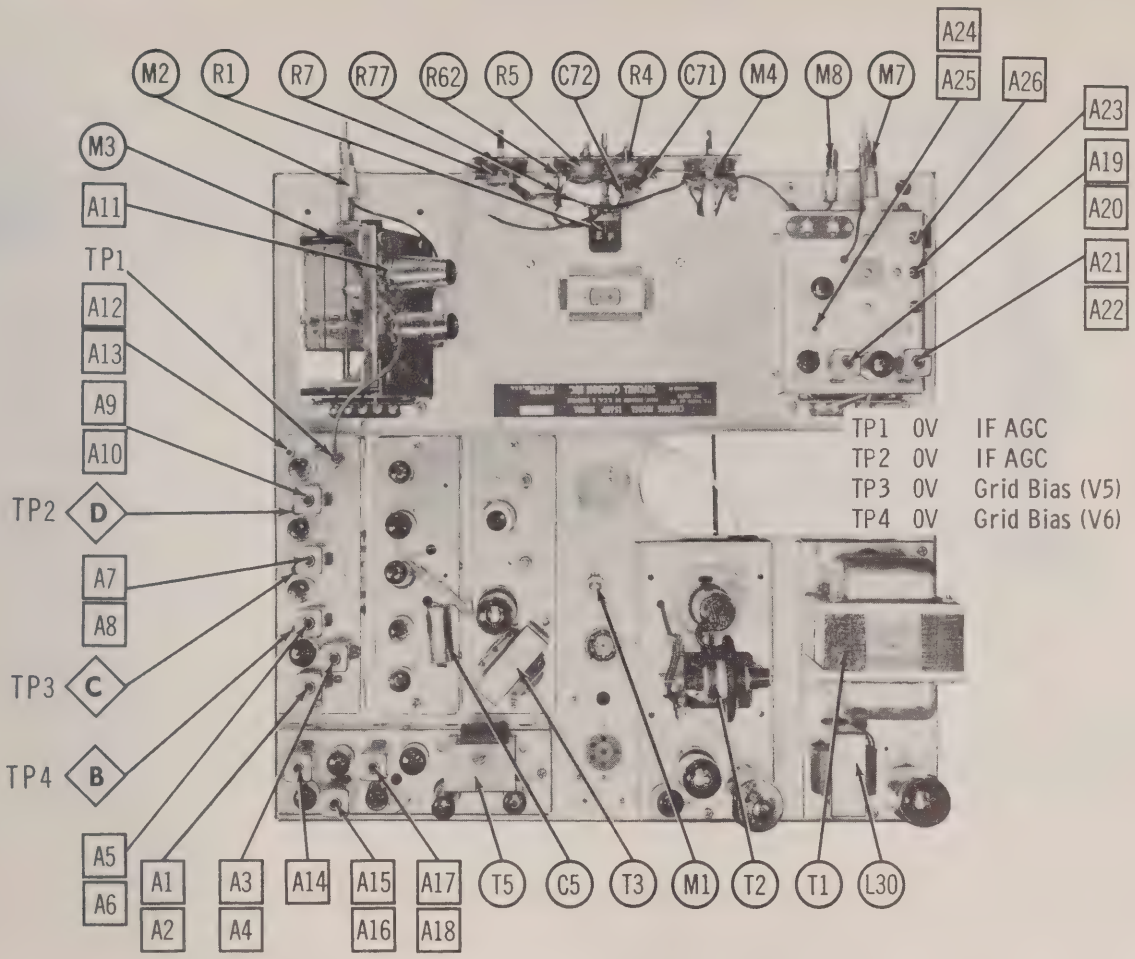
Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

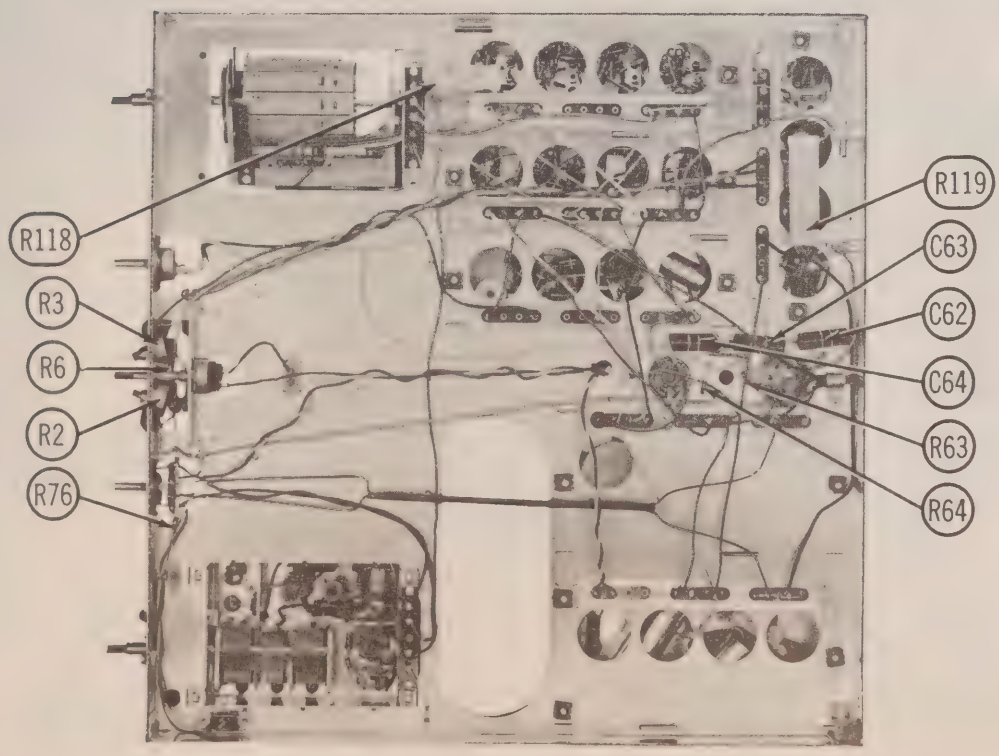
"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1956 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America


AM IF = 456KC
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
A PHOTOFACT STANDARD NOTATION SCHEMATIC
SETCHELL-CARLSON 56, 56-WR, 561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)

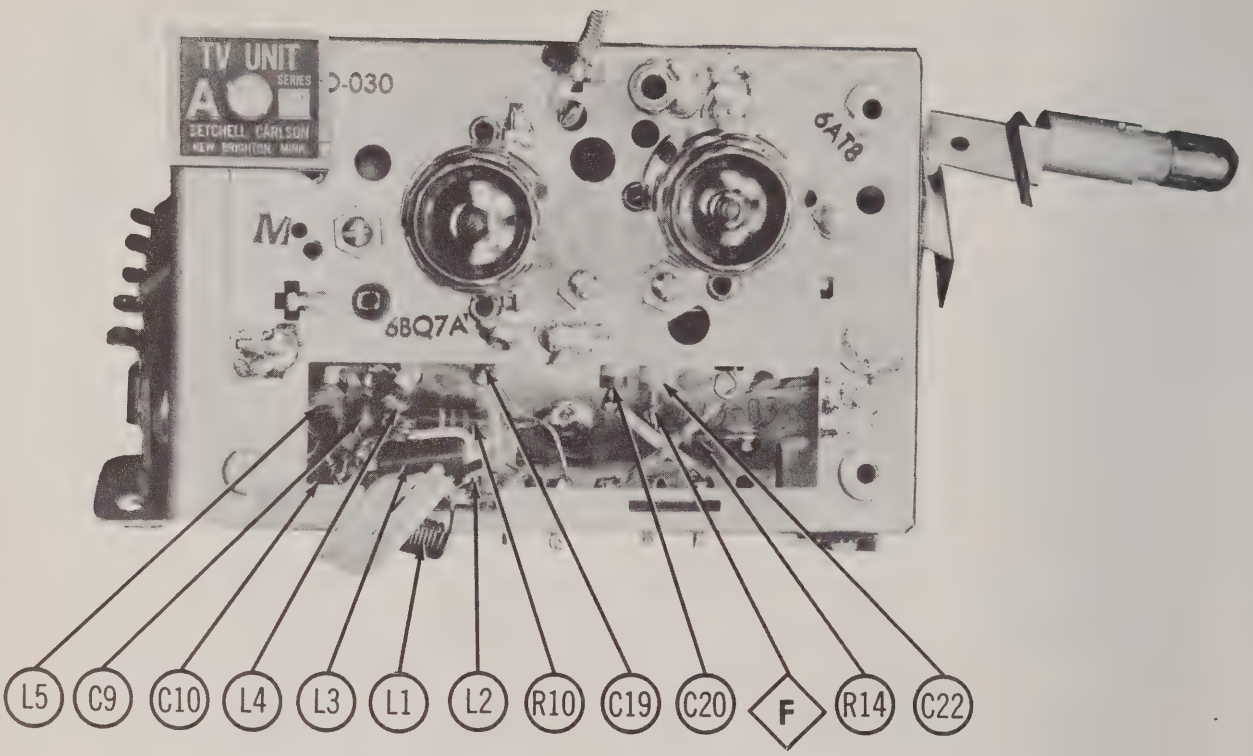
SETCHELL-CARLSON 56, 56-WR, 561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)



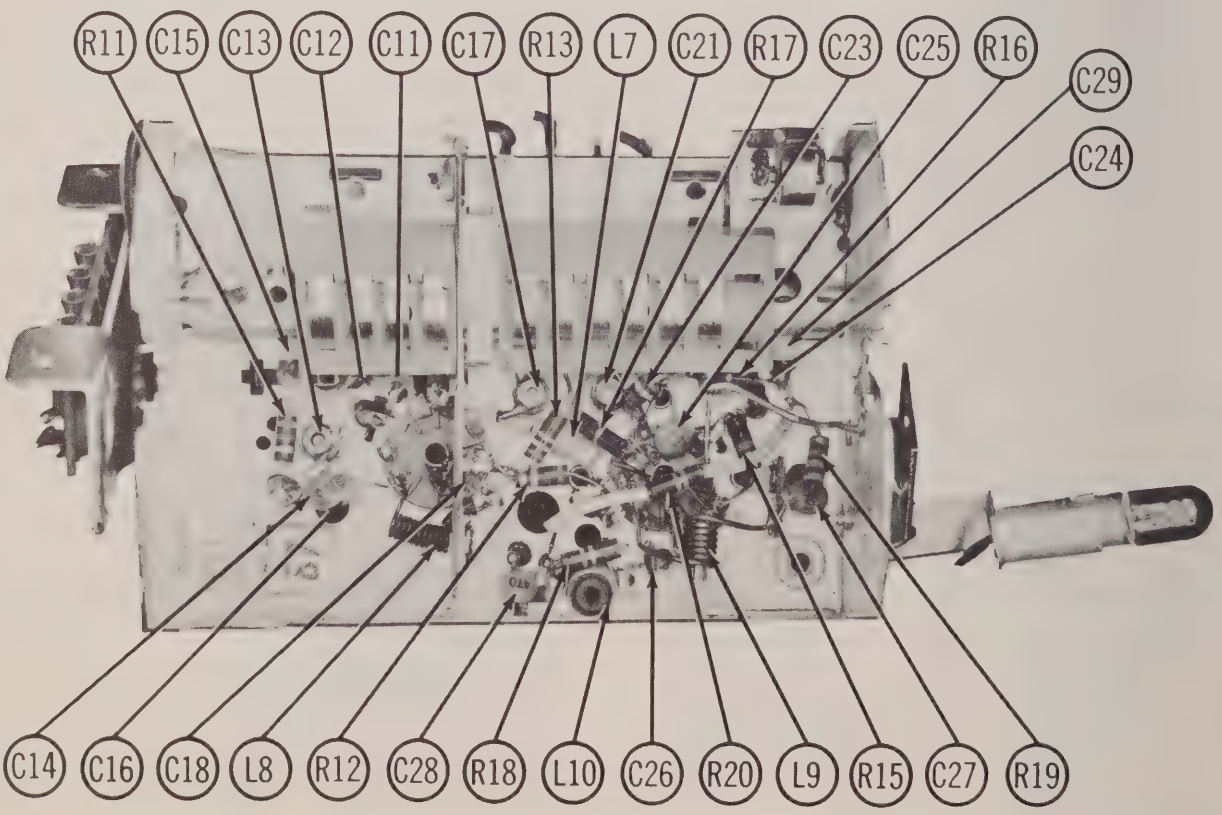
CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW

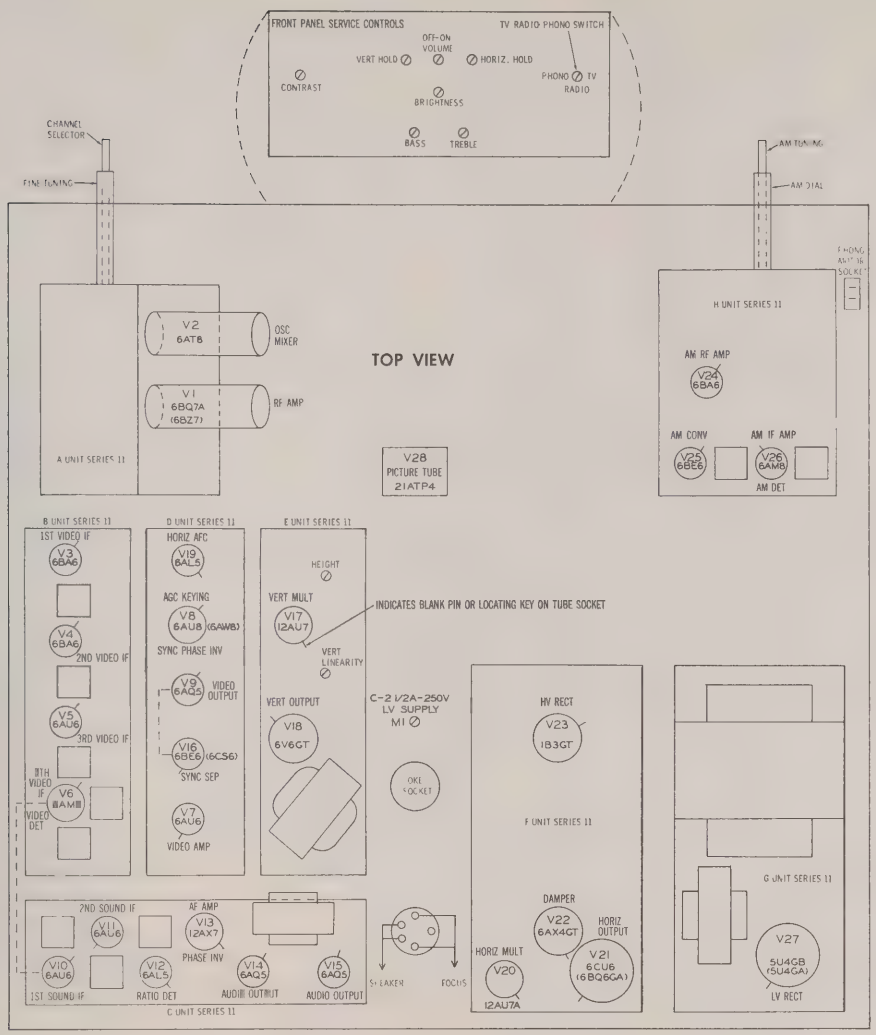


SUB-CHASSIS A UNIT TOP VIEW



SUB-CHASSIS A UNIT BOTTOM VIEW

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V27, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V2, V3, V4, V5, V6**
No pic, no sound, has snow - **V1, V2, V3**
No pic, has sound, has raster - **V7, V8, V9, V28**
Has pic, no sound - **V10, V11, V12, V13, V14, V15**
Overloaded picture - **V8**

SYNC FAILURE
No vert. sync - **V8, V17**
No horiz. sync - **V8, V19, V20**
No vert. or horiz. sync - **V8, V16**

SWEEP FAILURE
No raster, has sound - **V20, V21, V22, V23, V28**
No vertical deflection - **V17, V18**
Poor vert. linearity or foldover - **V17, V18**
Poor horiz. linearity or foldover - **V20, V21, V22**
Narrow picture - **V20, V21, V22, V23, V27**
Vert. off freq. - **V8, V17**
Horiz. off freq. - **V8, V19, V20**

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	REPLACEMENT DATA Setchell-Carlson PART No.	STANDARD REPLACEMENT	BASING
V1	RF Amplifier	6BQ7A	5BQ7A	
V2	Mixer-Oscillator	6A7S	6A7S	
V3	1st Video IF Amplifier	6BA6	6BA6	
V4	2nd Video IF Amplifier	6BA6	6BA6	
V5	3rd Video IF Amplifier	6AU6	6AU6	
V6	4th Video IF Amplifier- Video Detector	6AM8	6AM8	
V7	Video Amplifier	6AU6	6AU6	
V8	AGC Keying-Sync Phase Inv	6AU8	6AU8	
V9	Video Output	6AQ5	6AQ5	
V10	1st Sound IF Amplifier	6AU6	6AU6	
V11	2nd Sound IF Amplifier	6AU6	6AU6	
V12	Ratio Detector	6AL5	6AL5	
V13	AF Amplifier-A F Phase Inv	12AX7	12AX7	
V14	Audio Output	6AQ5	6AQ5	
V15	Audio Output	6AQ5	6AQ5	
V16	Sync Separator	6BA6	6BE6	
V17	Vert. Mult.	12AU7	12AU7	
V18	Vert. Output	6V6GT	6V6GT	
V19	Hantz. AFC	6AL5	6AL5	
V20	Horiz. Mult.	12AU7A	12AU7A	
V21	Horiz. Output	6CU6	6CU6	
V22	Damper	5AX4GT	6AX4GT	
V23	B+ Rectifier	1B3GT	1B3GT	
V24	AM RF Amplifier	6BA6	6BA6	
V25	Osc.	6BE6	6BE6	
V26	AM IF Amplifier- AM Detector	6AM8	6AM8	
V27	LV Rectifier	5U4GB	5U4GB	5U4GA may be used as alternate

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA Setchell-Carlson PART No.	GENERAL ELECTRIC PART No	SYLVANIA PART No	NOTES
V28	21AYP4 ‡ 21ATP4 ‡ 21ATP4 ‡	21ATP4 ‡	21ATP4 ‡	‡ Aluminized ‡ Silver screen '85'

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP	VOLT	REPLACEMENT DATA Setchell-Carlson PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	20	450	C-113	PR5450V20-	BSRD2345	TCD75	TDL-D20-450	FMD-4520	TVA-2730
B	20	450		20					
C2	80	450	C-113	PR5450V80	BSR5045	TCD78	TD-80-450	FM-4580	TVA-1718
C3	5	150		SRE150V5	BR045	TC40	TD-4-150	MMT-1505	TVA-1402
C4	10	450		PR5450V10	BR1045	TC72	TD-10-450	FM-4510	TVA-1705
C5	10	450		PR5450V10	BR1045	TC72	TD-10-450	FM-4510	TVA-1705
C6	100	50		SRE50V100	BR1S501	TC3001	TD-100-50	MTH-5010	TVA-1310
C7	30	50		SRE50V30	BR305	TC3035	TD-35-50	FM-5535	TVA-1306
C8	50	10 VNP	(Note 1)	BRE105	BRR100-15 * BRR100-15 *	TC1025 * TC1025 *	TD-50-10NP	MTH-1210 * MTH-1210 *	R2223 †

Note: Data C8 is a non-polarized unit.
* Connect negative leads together.
† Unit must be ordered from Mfgr.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP	VOLT	REPLACEMENT DATA Setchell-Carlson PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C9	120			BPD-0012	DD-121	G044	811-121	UC-5312	5GA-T12	
C10	5			NPO-D15	TC2-4R7	Z011	NPOA-050	ZT-5555	5TCCB-V47	
C11	6.8			NPO-D15.8	TC2-6R8	Z013	NPOA-6R8	ZT-5568	5TCCB-V68	
C12	6.8			NPO-D15.8	TC2-6R8	Z013	NPOA-6R8	ZT-5568	5TCCB-V68	
C13	2-10				829-10					
C14	3			NPO-D03	TC2-3R3	Z007	NPOA-030	ZT-553	5TCCB-V33	
C15	900									
C16	2.2			NPO-S22.2	TC2-2R3	Z006	NPOA-2R2		5TCCB-V22	
C17	.5-3				829-3		3135-01-0R5	CT565A		
C18	1000			BPD-001	DD-102	K069	801-001	DC-531	5HK-D1	
C19	900									
C20	800									
C21	.5-3				829-3		3135-01-0R5	CT565A		
C22	68									
C23	1			NPO-S01	TC2-1	T003	NPOA-010		5TCCB-V1	
C24	68									
C25	68									
C26	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C27	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C28	470			BPD-00047	DD-471	K060	831-471	UC-5347	5GA-T47	
C29	800									
C30	35			NPO-000015	DD-150	Q031	831-150	UC-5415	5GA-Q15	Note 2
C31	56			NPO-S236	TC2-56	Z036	NPO-337-560		5TCC-Q56	
C32	56			NPO-S236	TC2-56	Z036	NPO-337-560		5TCC-Q56	
C33	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C34	1.5		C-103							
C35	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C36	1000			BPD-01	DD-102	K063	811-01	DC-511	5HK-B1	Note 3
C37	.47	200		P2047-47		CUB2P47		PT4047	2TM-P47	
C38	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C39	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C40	.68		C-103							Note 4
C41	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C42	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C43	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C44	.82		C-103							
C45	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C46	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C47	1.5			NPO-S01.5	TC2-1R5	T004	NPOA-1R5	ZT-5515	5TCCB-V15	Note 5
C48	68		C-106		TC2-R68	T068	NPOA-0R68			
C49	68		C-106		TC2-R68	T068	NPOA-0R68			Note 3
C50	5.6		C-109	NPO-S05.6	TC2-5R6	T056	NPOA-5R6	ZT-5568	5TCCB-V68	
C51	10000			BPD-01	DD-103	K093	811-01	DC-511	5HK-B1	
C52	047	400		DF-S03	DD-473	CUB4S47		PT4147	4TM-S47	
C53	047	400		DF-S03	DD-473	CUB4S47		PT4147	4TM-S47	
C54	270	500		S2270	D6-271	5W5T27	GPEK-271	UC-5337	1FM-327	
C55	10000			BPD-01	DD-103	K093	811-01	DC-511	5HK-B1	
C56	3000			BPD-003	DD-302	K078	811-003	UC-523	5HK-D3	
C57	10000			BPD-01	DD-103	K093	811-01	DC-511	5HK-B1	
C58	8.0	500				IW5T81	811-811		1FM-381	

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING CAP	VOLT	REPLACEMENT DATA Setchell-Carlson PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C59	810	500		SI810		IW5T81	811-811		1FM-381	
C60	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C61	3000			BPD-003	DD-302	K078	811-003	UC-523	5HK-D3	
C62	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C63	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C64	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C65	8.8		C-109	NPO-S16.8	TC2-8R8	T208	NPOA-8R8	ZT-5588	5TCCB-V88	
C66	10000			BPD-01	DD-103	K083	811-01	DC-511	5HK-B1	
C67	10000			BPD-01	DD-103	K083	811-01	DC-511	5HK-B1	
C68	10000			BPD-01	DD-103	K083	811-01	DC-511	5HK-B1	
C69	10000			BPD-01	DD-103	K083	811-01	DC-511	5HK-B1	
C70	910	500		SI910		IW5T91	811-911		1FM-391	
C71	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	Note 6
C72	470	500		D6-471	D6-471	5W5T47	GP3K-471	UC-5347	1FM-347	
C73	10000			BPD-01	DD-103	K083	811-01	DC-511	5HK-B1	
C74	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C75	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C76	3000			BPD-003	DD-302	K078	811-003	DC-523	5HK-D3	
C77	.0047	400		S4700	D6-472	CUB4D47	GP3-333-472	PT5247	6TM-D47	
C78	.0047	400		S4700	D6-472	CUB4D47	GP3-333-472	PT5247	6TM-D47	
C79	.01	400		BPD-01	D6-103	CUB4S1	GP3-333-103	PT411	4TM-S1	
C80	.0047	400		S4700	D6-472	CUB4D47	GP3-333-472	PT5247	6TM-D47	
C81	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C82	.33	400		P4S8N-33		CUB4P33		PT4033	4TM-P33	
C83	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C84	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C85	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C86	270	500	C-102	1469-00027	TC2-270	5R5T27	NPO-335-271	MCE241	MS-327	
C87	270	500	C-102	1469-00027	TC2-270	5R5T27	NPO-335-271	MCE241	MS-327	
C88	910	500		1464-00091		1R5T91			MS-391	
C89	3000			BPD-003	DD-302	K078	811-003	UC-523	5HK-D3	
C90	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C91	.0027	400		1464-0027		1R5D27		MCE461	MS-227	Note 7
C92	470	500		S1470	D6-471	5W5T47	GP5K-471	UC-5347	1FM-347	
C93	.1	400		P4S8N-1	DF-104	CUB4P1		PT401	4TM-P1	
C94	75	3000	C-111							
C95	56	500		S156	D6-560	5W5G56	GP5K-560	UC-5456	1FM-456	Note 8
C96	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C97	56	500		S156	D6-560	5W5G56	GP5K-560	UC-5456	1FM-456	Note 8
C98	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C99	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	
C100	56	500		S156	D6-560	5W5G56	GP5K-560	UC-5456	1FM-456	Note 8
C101	.047	400		BPD-05	DF-503	CUB4S47		PT4147	4TM-S47	

Note 2. Some versions may use 10MMF in this application (part #C-110).
Note 3. Not used in some versions.
Note 4. Some versions may use 1MMF in this application (part #C-104).
Note 5. Some versions may use 2.2MMF in this application (part #C-108).
Note 6. Some versions may use .0047MFD in this application
Note 7. Some versions may use .003MFD in this application.
Note 8. Some versions may use 100MMF in this application.

CONTROLS

ITEM No	RATING RESIST ANCE	WATTS	REPLACEMENT DATA Setchell-Carlson PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	806	B-60-S	A47-500K-Z	Q13-133	U-48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A.
C	Switch		Not Req.	Not Req.	SWE-12	76-1	US-26	Attach to R1A.
R2A	100KΩ	½	802	BX-40	A47-100K-S	Q11-128	TA15L	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FKS-1/4	SQ	Not Req.	Attach to R2A.
R3A	2Meg	½	803	BX-75	A47-2Meg-S	Q11-139	TA25L	Brightness
B	Shaft		Not Req.	Not Req.	FKS-1/4	SQ	Not Req.	Attach to R3A.
R4A	500KΩ	½	804	AB-60	A47-500K-Z	Q13-133	U-48	Treble
B	Shaft		Not Req.	AK-1	Not Req.	Not Req.	Not Req.	Attach to R4A.
R5A	2Meg	½	803	BX-75	A47-2Meg-S	Q11-139	TA25L	Bass
B	Shaft		Not Req.	Not Req.	FKS-1/4	SQ	Not Req.	Attach to R5A.
R6A	2Meg	½	803	BX-75	A47-2Meg-S	Q11-139	TA25L	Vert. Hold
B	Shaft		Not Req.	Not Req.	FKS-1/4	SQ	Not Req.	Attach to R6A.
R7A	4000Ω	½	805	AB-12	A47-10K-Y	Q17-112	U-19	Contrast
B	Shaft		Not Req.	AK-3	FS-3	Not Req.	Not Req.	Attach to R7A.
R8A	2000Ω	½	801	AB-705		Q17-110	U-7	Vert. Linearity
B	Shaft		Not Req.	AK-1		SQ	Not Req.	Attach to R8A.
R9A	2Meg	½	803	BX-75	A47-2Meg-S	Q11-139	TA25L	Height
B	Shaft		Not Req.	Not Req.	FKS-1/4	SQ	Not Req.	Attach to R9A.

RESISTORS

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA Setchell-Carlson PART No.	IRC PART No.	NOTES
R10	680KΩ	½		BTS-680K	
R11	4700Ω	½		BTS-4700	
R12	820KΩ	½		BTS-820K	
R13	470KΩ	½		BTS-470K	
R14	220KΩ	½		BTS-220K	
R15	10KΩ	½		BTS-10K	
R16	5800Ω	½		BTS-5800	
R17	8200Ω	½		BTS-8200	
R18	22KΩ	½		BTS-22K	
R19	47KΩ	½		BTS-47K	
R20	15KΩ	½		BTS-15K	
R21	1500Ω	½		BTS-1500	
R22	15Meg	½		BTS-15Meg	
R23	470Ω	½		BTS-470	
R24	470KΩ	½		BTS-470K	
R25	100KΩ	½		BTS-100K	
R26	470Ω	½		BTS-470	
R27	150Ω	½		BTS-150	
R28	4700Ω	½			
R29	820Ω	½		BTS-820	
R30	150Ω	½		BTS-150	
R31	3900Ω	½			
R32	470Ω	2		BTB-470	
R33	1800Ω	½		BTS-180	
R34	4700Ω	½		BTS-4700	
R35	470Ω	½		BTS-470	
R36	180Ω	½		BTS-180	
R37	1Meg	½		BTS-1Meg	
R38	30000Ω 5%	½		BTS-30000 5%	
R39	3900Ω	½		BTS-3900	Note 1
R40	22kΩ	½		BTS-22K	
R41	220KΩ	½		BTS-220K	
R42	22KΩ	½		BTS-22K	

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA Setchell-Carlson PART No.	IRC PART No.	NOTES
R43	1Meg	½		BTS-1Meg	
R44	3300Ω	2		BTB-3300	
R45	470Ω	½		BTS-470	
R46	1Meg	½		BTS-1Meg	
R47	22KΩ	½		BTS-22K	
R48	2.2Meg	½		BTS-2.2Meg	
R49	22KΩ	½		BTS-22K	
R50	2.2Meg	½		BTS-2.2Meg	
R51	47KΩ	½		BTS-47K	
R52	220KΩ	½		BTS-220K	
R53	470KΩ	½		BTS-470K	
R54	47KΩ	½		BTS-47K	
R55	6800Ω	½		BTS-6800	
R56	22KΩ	½		BTS-22K	
R57	5600Ω	½		BTS-5600	
R58	220KΩ	½			
R59	220KΩ	½			
R60	2.2Meg	½			
R61	4.7Meg	½			
R62	100KΩ	½		BTS-100K	
R63	10Meg	½		BTS-10Meg	
R64	10KΩ	½		BTS-10K	
R65	4.7Meg	½		BTS-4.7Meg	
R66	1500Ω	½		BTS-1500	Note 3
R67	470Ω	½		BTS-470	
R68	82Ω	½		BTS-82	
R69	150Ω	½		BTS-150	
R70	150Ω	½		BTS-150	
R71	47KΩ	½		BTS-47K	
R72	6800Ω	½		BTS-6800	
R73	6800Ω	½		BTS-6800	
R74	10Meg	½		BTS-10Meg	
R75	220KΩ	½		BTS-220K	

RESISTORS (cont)

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA Setchell-Carlson PART No.	IRC PART No.	NOTES
R76	47KΩ	½		BTS-47K	
R77	220KΩ	½		BTS-220K	
R78	15KΩ	½		BTS-15K	
R79	220KΩ	½		BTS-220K	
R80	2300Ω	½		BTS-2300	
R81	470KΩ	½		BTS-470K	
R82	470KΩ	½		BTS-470K	
R83	10KΩ	½		BTS-10K	
R84	10KΩ	2		BTB-10K	
R85	470Ω	2		BTB-470	
R86	100KΩ	½		BTS-100K	
R87	220KΩ	½		BTS-220K	
R88	470KΩ	½		BTS-470K	
R89	1Meg	½		BTS-1Meg	
R90	470KΩ	½		BTS-470K	
R91	4.7Meg	½		BTS-4.7Meg	
R92	47KΩ	½		BTS-47K	
R93	8200Ω	½		BTS-8200	
R94	1000Ω	1		BTA-1000	
R95	560Ω	½			
R96	560Ω	½			
R97	180KΩ	½		BTS-180K	
R98	150KΩ	½		BTS-150K	

ITEM No.	RATING OHMS	WATT	REPLACEMENT DATA Setchell-Carlson PART No.	IRC PART No.	NOTES
R99*	27KΩ	2			
R100	820Ω	½			
R101	22KΩ	½			
R102	2.2Meg	½			
R103	22KΩ	½			
R104	82Ω	½			
R105	50KΩ	10	R-101		
R106	150Ω	2			
R107	27KΩ	2			
R108	2.2Ω	1		BW½-2.2	
R109	2200Ω	½			
R110	1Meg	½		BTS-1Meg	
R111	22KΩ	½		BTS-22K	
R112	1Meg	½		BTS-1Meg	
R113	220KΩ	½		BTS-220K	Note 2
R114	18KΩ	2		BTB-18K	Note 4
R115	820Ω	½		BTS-820	Note 5
R116	470KΩ	½		BTS-470K	
R117	47KΩ	½		BTS-47K	
R118	5000Ω	5	R-102	PW7-5000	
R119	2500Ω	20	R-103	2D-2500	
R120	3000Ω	5	R-100	PW7-3000	
R121	2Ω	10	R-104	PW10-2	

Note 1. Some versions use a 3000Ω ½W 5% resistor in this application.
Note 2. Not used in some versions.
Note 3. Some versions use a 1200Ω ½W resistor in this application.
Note 4. Some versions use a 47KΩ 2W resistor in this application.
Note 5. Some versions use a 1500Ω ½W resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA Bimlbell-Carlson PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
	PRI.	SEC. 1	SEC. 2	SEC. 3						
T1	117VAC	640VCT	5VAC	6.3VAC	T-112					
	@ 1.68A	@ .250A	@ 3A	@ 6.7A						

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA Setchell-Carlson PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Rom PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T3	Horiz. Output Trans.	T-111	FB419 * ①	HVO-54 * ②		X129 * ②	A-8265 * ②	FLY-78 * ②	D-49 * ②
T3	Vert. Output Trans.	T-101	Z1900 ③						
T4A	Yoke(90°)	Horiz.(22kH)	Y-100 ④	DF807 ③ ⑦	MDF-92 ③	235D1 ③ ⑦	Y90F1943 ③ ⑦	DY-16A ③	Y-16 ③ ⑦	Y-41-1 ③
B		Vert. (39MH)	Y-101 ⑤	⑦						

① Drill new mounting hole(s).
② Use original mounting brackets.
③ Connect terminal #2 to terminal #3. Connect terminal #4 to terminal #5. Then connect terminal #1 to plate (pin #3 of V18); terminal #12 to yoke socket pin #6 (B+).
④ Yoke only. Does not include rear cover and centering device, capacitor C84, resistors R95, R96, R109, nor leads.
⑤ Yoke rear cover and centering device.
⑥ Use original rear cover and centering device.
⑦ Connect horizontal damping network across terminals #3 and #7. Use original if necessary.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Rom Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	5	9	5		5	5	5	5
	4	7	4		4	4	4	6
	3	5	4		4	4	4	7
	1	3	2		2	2	2	2
	7	6	7		7	7	7	3
	8	2	8		8	8	8	4
Special Note →		⑧			⑧	⑧	⑧	⑧

⑧ Requires two turns on filament winding.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	SEC.	REPLACEMENT DATA Setchell-Carlson PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T5	11KΩ	3-4Ω	T-110	Z1003	A2935	A3823	24S61	S-53X	

SPEAKER

ITEM No.	RATINGS SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA Setchell-Carlson PART No.	QUAM PART No.	RCA TYPE No.	NOTES
SP1	8"	PM	3-4Ω	W-101	8A10X		① Used in some versions.
SP2	8"	PM	3-4Ω	W-102	8A21		
	10"	PM		W-103 ①	10A10X		
	6"	PM		W-104 ①	6A1	224S1	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA Setchell-Carlson PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coil	0Ω						
L2	Ant. Matching Trans.	0Ω						
L3	Ant. Matching Trans.	0Ω						
L4	FM Trap	0Ω						
L5	IF Trap	.1Ω						
L6	Ant., RF, Mixer Grid, Osc. Coils	0Ω						
L7	Fil. Choke	0Ω						
L8	Neut. Coil	0Ω						

SETCHELL-CARLSON 56, 56-WR, 561, 562, 563, 5601, 5602, 5603 (Ch. 156-RP)

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA Setchell-Carlson PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L9	RF Coil	0Ω						
L10	1st. Video IF	.1Ω						
L11A	44.25MC Trap	0Ω						
B	50.25MC Trap	0Ω		T-108				
L12	2nd. Video IF	0Ω	0Ω	T-105				
L13	Fil. Choke	0Ω			19-1001		4604	
L14	3rd. Video IF	0Ω	0Ω	T-105				
L15	4th. Video IF	0Ω	0Ω	T-105				
L16	5th. Video IF	0Ω	0Ω	T-105				
L17A	44.25MC Trap							
B	50.25MC Trap			T-107				
L18	Series Peaking Coil	.9Ω		L-106	19-1005		4612	12 Microhenries.
L19	Series Peaking Coil	8Ω		L-104	19-3125		6153	132 Microhenries.
L20	Series Peaking Coil	16Ω		L-102	19-3300*		6155*	300 Microhenries; - Wound on 22KΩ Resistor.
L21	Shunt Peaking Coil	13Ω		L-104	19-4201*		6154*	220 Microhenries; - Wound on 22KΩ Resistor.
L22	1st. Sound IF	6.8Ω		L-105				
L23	2nd. Sound IF	2.1Ω	2.1Ω	T-109	16-3445	TV-113	6203	
L24	Ratio Det.	7Ω	1.7Ω CT.	T-104	17-3497	TV-115	6205	Tertiary Winding - .8Ω.
L25	AM Ant. Coupling Coil	6.3Ω		L-107				
L26	AM RF Coil	70Ω	7.7Ω	T-113				
L27	AM Osc. Coil	5Ω		T-114				Tapped @ .6Ω
L28	AM Input IF	23Ω	23Ω	T-115	16-6758	BC-352	12-C1	
L29	AM Output IF	23Ω	23Ω	T-115	16-6758	BC-353	12-C2	

* Parallel with 22KΩ resistor.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA Setchell-Carlson PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L30	.250A	26.5Ω	1.3HY	L-108	C5040 ①		C2328 ①	26C44	C-23X

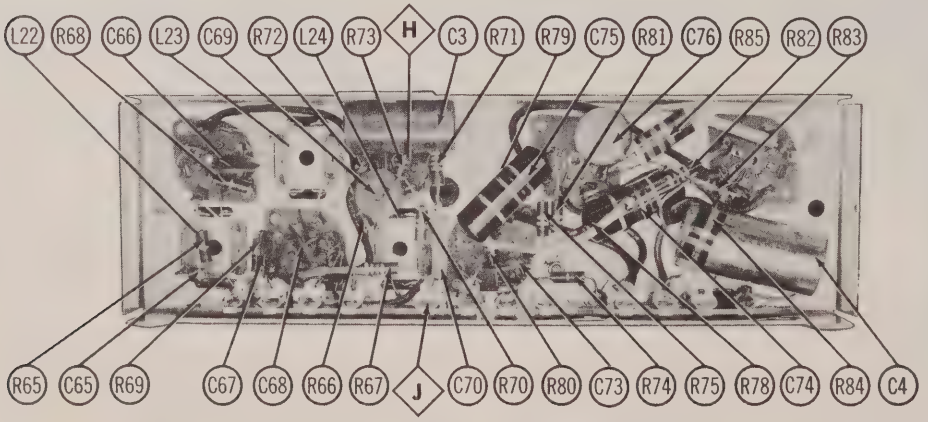
① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA Setchell-Carlson PART No. FUSE	Setchell-Carlson PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	C	2½A 250V	F-103	F-102	33202.5 (C2½A)	346006	C2½	HC 1 3/4-2½

MISCELLANEOUS

ITEM No.	PART NAME	Setchell-Carlson PART No.	NOTES
M2	Dial Light		TV-#44
M3	Tuner	TD-030	VHF
M4	Switch	S-107	TV-Radio-Phono (3 Pole, 3 Position-Rotary, Wafer Type)
M5	Centering Device	Y-101	Includes Deflection Yoke (T4) Rear Cover
M6	Ion Trap		
M7	Dial Light		Radio-#47
M8	Pilot Light		Phono-#47
M9	Tuning Cap.	H-201	3 Gang (32-470MMF, 30-475MMF, 32-190MMF)
	Knob	K-103	Channel Selector-Amber or Clear (Specify)
	Knob	K-104	Fine Tuning-Amber or Clear (Specify)
	Knob	K-107	Contrast, Radio Tuning (Radio Models) Amber or Clear (Specify)
	Knob	K-109	On-Off-Volume-Amber or Clear (Specify)
	Knob	K-108	Radio Dial and Rim Assy.- Amber or Clear (Specify)
	Mask	G-105	Models 561, 562, 563, 56, & 56-WR
	Mask	G-106	Models 5601, 5602, 5603.
	Safety Glass	G-102	Models 561, 562, 563, 56, & 56-WR
	Safety Glass	G-103	Models 5601, 5602, 5603

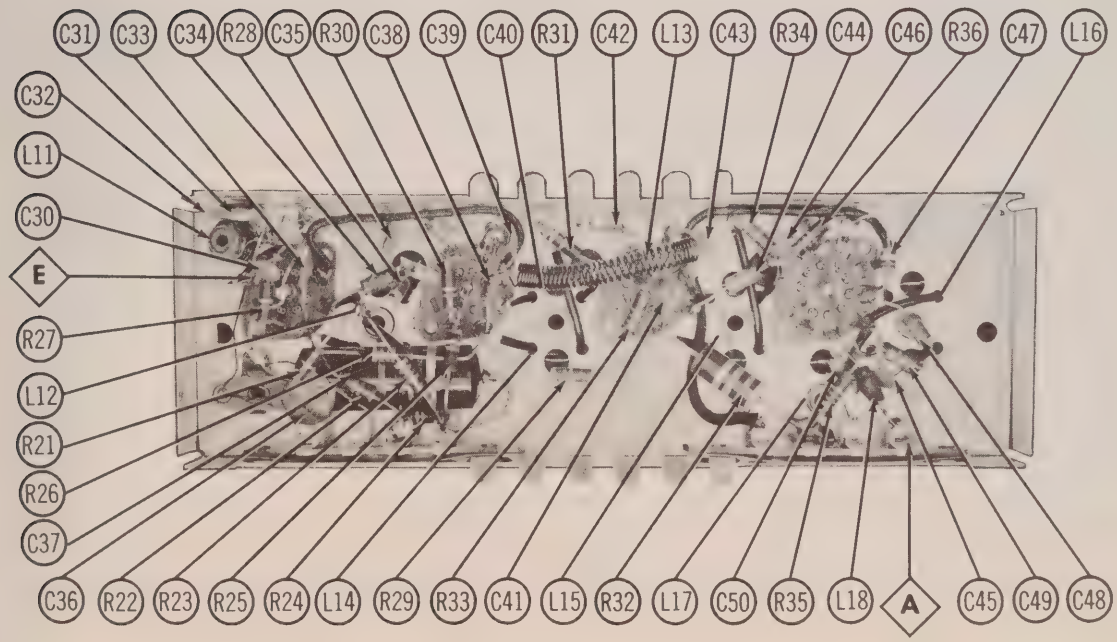


SUB-CHASSIS C UNIT

RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	INF	600KΩ	0Ω	0Ω	.1Ω	† 5KΩ	300KΩ	INF	0Ω
V 2	6AT8	10KΩ	† 8KΩ	0Ω	0Ω	.1Ω	† 18KΩ	† 50KΩ	0Ω	220KΩ
V 3	6BA6	100KΩ	0Ω	0Ω	.1Ω	† 4.3KΩ	† 4.3KΩ	150Ω		
V 4	6BA6	100KΩ	0Ω	0Ω	.1Ω	† 3.8KΩ	† 3.8KΩ	150Ω		
V 5	6AU8	0Ω	180Ω	0Ω	.1Ω	† 3KΩ	† 3KΩ	180Ω		
V 6	6AM8	180Ω	0Ω	† 3KΩ	0Ω	.1Ω	† 3KΩ	0Ω	3KΩ	180Ω
V 7	6AU6	1Meg	0Ω	0Ω	.1Ω	† 6.5KΩ	† 2.5KΩ	0Ω		
V 8	6AU8	5.6KΩ	40KΩ	† 9.5KΩ	.1Ω	0Ω	† 2.5KΩ	† 30KΩ	† 22KΩ	320KΩ
V 9	6AQ5	1Meg	800Ω	0Ω	.1Ω	† 3.3KΩ	† 2.5KΩ	1Meg		
V 10	6AU6	4.7Meg	0Ω	0Ω	.1Ω	† 4.5KΩ	† 4.5KΩ	82Ω		
V 11	6AU6	2.1Ω	0Ω	0Ω	.1Ω	† 3KΩ	† 3KΩ	150Ω		
V 12	6AL5	1.5Meg	1.5Meg	0Ω	.1Ω	6.8KΩ	0Ω	6.8KΩ		
V 13	12AX7	† 230KΩ	10Meg	0Ω	0Ω	0Ω	† 230KΩ	15KΩ	2.2KΩ	.1Ω
V 14	6AQ5	500KΩ	470Ω	0Ω	.1Ω	† 2.2KΩ	† 12KΩ	500KΩ		
V 15	6AQ5	470KΩ	470Ω	0Ω	.1Ω	† 2.2KΩ	† 12KΩ	470KΩ		
V 16	6BE6	2.2Meg	0Ω	0Ω	.1Ω	† 100KΩ	† 50KΩ	2.2Meg		
V 17	12AU7	† 1.5Meg	1.5Meg	4.7KΩ	0Ω	0Ω	† 220KΩ	0Ω	4.7KΩ	.1Ω
V 18	6V6GT	TP	.1Ω	† 550Ω	† 230Ω	4.7Meg	TP	0Ω	1.5KΩ	
V 19	6AL5	27KΩ	27KΩ	.1Ω	0Ω	5Meg	0Ω	5Meg		
V 20	12AU7A	† 150KΩ	150KΩ	820Ω	.1Ω	.1Ω	† 27KΩ	7Meg	820Ω	0Ω
V 21	6CU6	TP	0Ω	TP	▲ 50KΩ	2.2Meg	TP	.1Ω	150Ω	TOP CAP ▲ 10Ω
V 22	6AX4GT	TP	NC	INF	NC	† 27Ω	NC	.1Ω	0Ω	
V 23	1B3GT		PINS	1-8	HAVE	INF	RESISTANCE			TOP CAP ▲ 475Ω
V 24	6BA6	2.5Meg	0Ω	0Ω	♦ .1Ω	† 5KΩ	† 23KΩ	0Ω		
V 25	6BE6	22KΩ	.6Ω	0Ω	♦ .1Ω	† 5KΩ	† 23KΩ	1.5Meg		
V 26	6AM8	820Ω	23Ω	† 23KΩ	0Ω	♦ .1Ω	† 5KΩ	23Ω	470KΩ	0Ω
V 27	5U4GB	NC	70KΩ	NC	38Ω	NC	40Ω	TP	70KΩ	
V 28	21ATP4	0Ω	1Meg	PIN 6 † 27Ω	PIN 10 † 27Ω	PIN 11 † 400KΩ	PIN 12 .1Ω			

† MEASURED FROM PIN 8 OF V27.
▲ MEASURED FROM PIN 3 OF V22.
♦ MEASURED IN "RADIO" POSITION.
NC-NO CONNECTION.
TP-TIE POINT.



SUB-CHASSIS B UNIT

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

High voltage lead should be securely taped away from the chassis. Remove the mixer-osc. tube from its socket. This will disable the local oscillator and reduce the possibility of erroneous indications.

VIDEO IF ALIGNMENT

Remove the mixer osc. tube from its socket. This will disable the local oscillator and reduce the possibility of erroneous indications.
Connect the negative lead of an 8 volt bias battery to point Ⓖ. Positive to chassis.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to point Ⓑ. Low side to chassis.	46.5MC (10MC Swp)	48.0MC 50.25MC 44.25MC	Any	Vert. Amp. to point Ⓐ. Low side to chassis.	A1, A2, A3, A4	Adjust for response curve similar to Fig. 1. Adjust A1 and A2 to place 48MC marker on response curve. Adjust A3 to place 50.25MC marker in trap notch. Adjust A4 for proper placement of 44.25MC marker in trap notch.
2.	"	High side to point Ⓒ. Low side to chassis.	"	"	"	"	A5, A6	Adjust for response similar to Fig. 2.
3.	"	High side to point Ⓓ. Low side to chassis.	"	"	"	"	A7, A8	Adjust for response similar to Fig. 2.
4.	"	High side to point Ⓔ. Low side to chassis.	"	"	"	"	A9, A10	Adjust for response curve similar to Fig. 2. Remove bias voltage and check response curve. Without bias voltage the response curve should be similar to Fig. 2.
5.	"	High side to point Ⓕ. Low side to chassis.	"	"	"	"	A11, A12, A13	Replace V2 in its socket and reconnect bias voltage to same point. Adjust A11 for MINIMUM tilt. Adjust A12 to place marker in 50.25MC trap notch. Adjust A13 to place 44.25MC marker in trap notch. If necessary to obtain proper response similar to Fig. 3, retouch SLIGHTLY A1, A2 and A5 thru A11.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
6.	.01MFD	High side to point Ⓐ. Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point Ⓗ. Common to chassis.	A14, A15, A16, A17	Detune A18 by turning core away from center position. Adjust A14 thru A17 for maximum deflection. Attenuate signal generator output to maintain, not more than 3 or 4 volts at VTVM.
7.	"	"	"	"	DC probe to point Ⓙ. Common to chassis.	A18	Adjust for zero reading. A positive and a negative reading will be obtained on either side of correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
6.	.01MFD	High side to point Ⓐ. Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point Ⓗ. Low side to chassis.	A14, A15, A16, A17	Disconnect stabilizing capacitor (C3). Adjust for curve of maximum amplitude and symmetry (Fig. 4).
7.	"	"	"	"	"	Vert. Amp. to point Ⓙ. Low side to chassis.	A18	Reconnect C3. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 5. SLIGHTLY retouch A17 for maximum amplitude and straightness of crossover lines.

TUNER ALIGNMENT

The tuner portion of this receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

RADIO ALIGNMENT

Set "Radio-Phono-TV" switch to the "Radio" position.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment hex tool and insulated screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
8.	.01MFD	High side to pin 7 (grid) of 6BE6 (V25). Low side to chassis.	456KC (400∿Mod)	AM	Tuning gang fully open	Across voice coil	A19, A20 A21, A22	Adjust for maximum deflection.
9.	"	"	1620KC	"	"	"	A23	"
10.		Loop	1400KC	"	Tune to 1400KC signal	"	A24, A25 A26	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

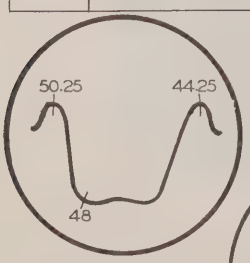


FIG. 1

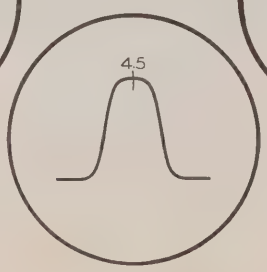


FIG. 4

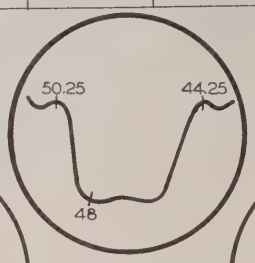


FIG. 2

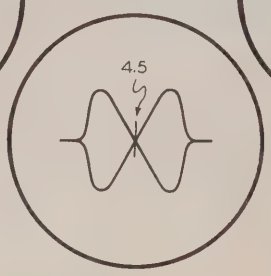


FIG. 5

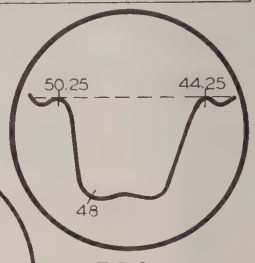
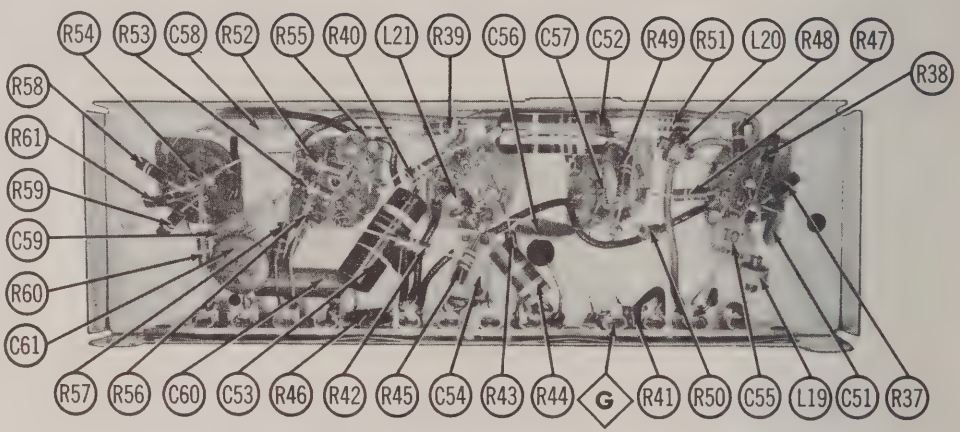
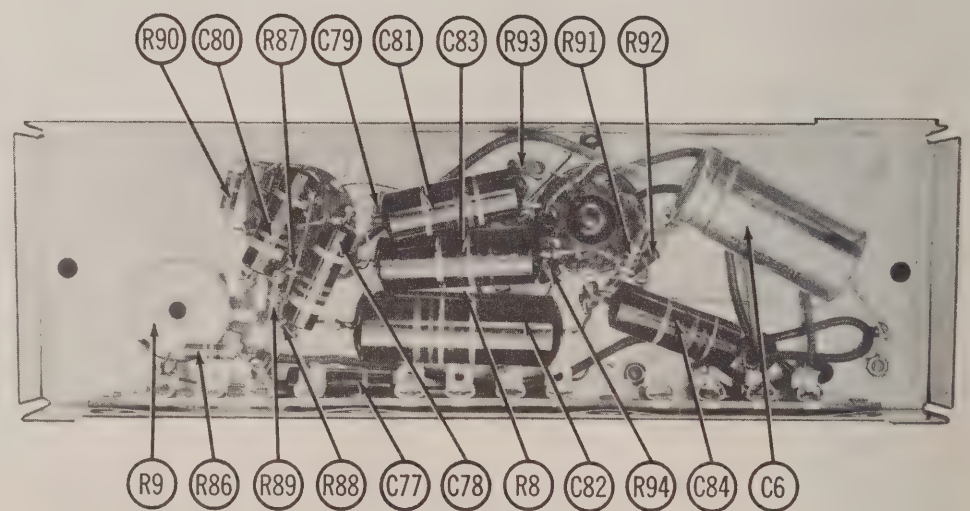


FIG. 3



SUB-CHASSIS D UNIT



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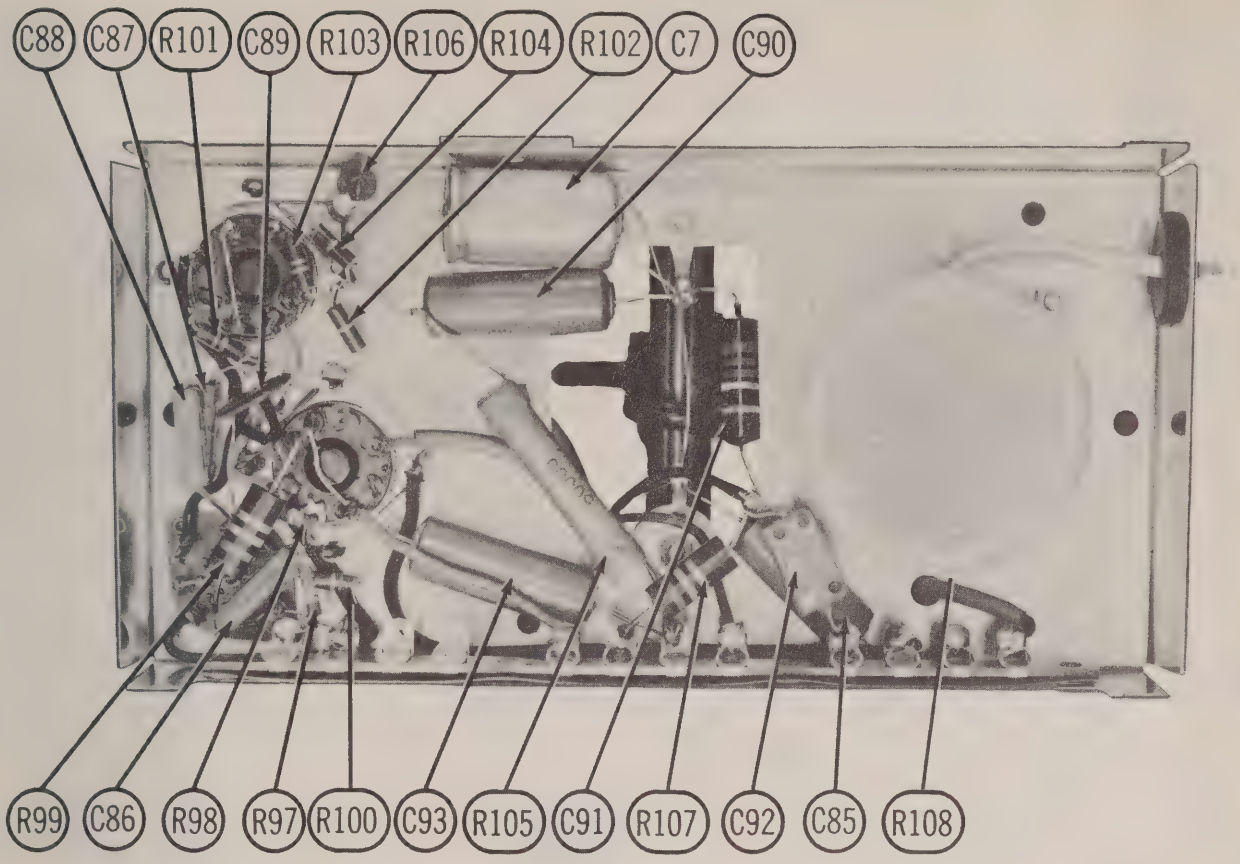

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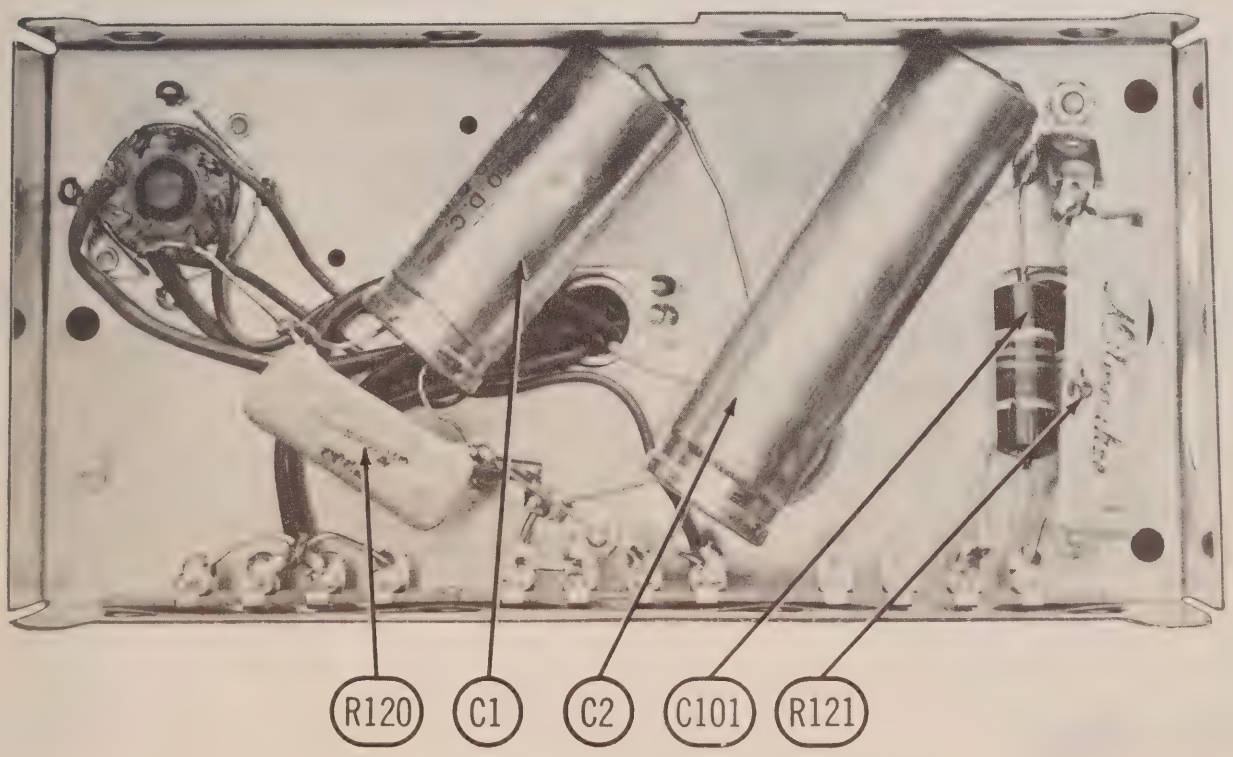

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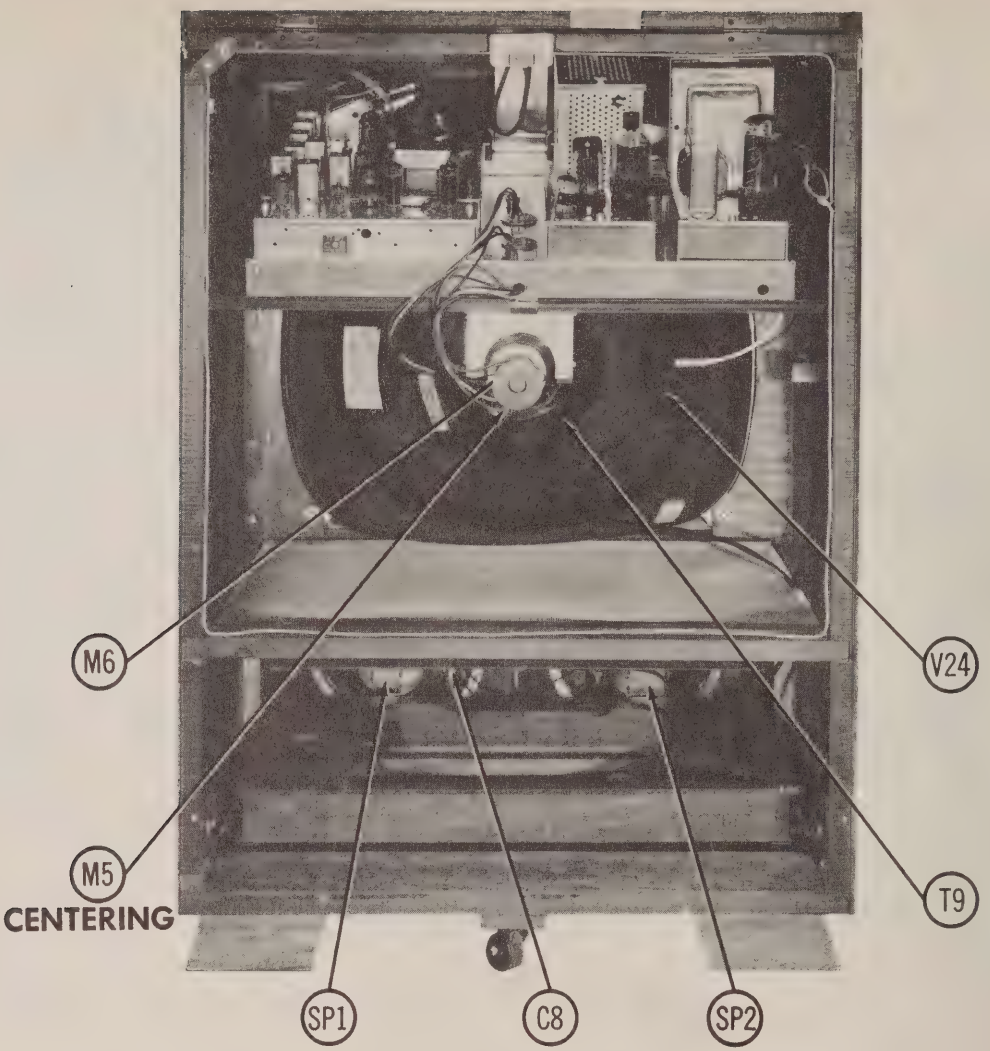
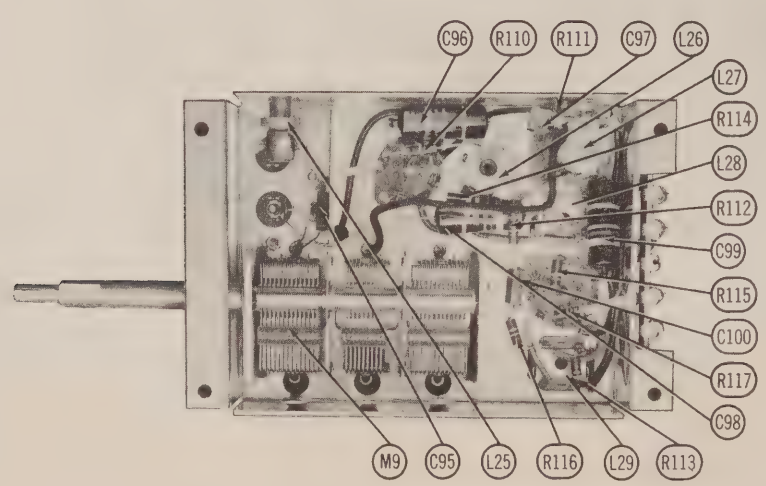


CABINET–REAR VIEW

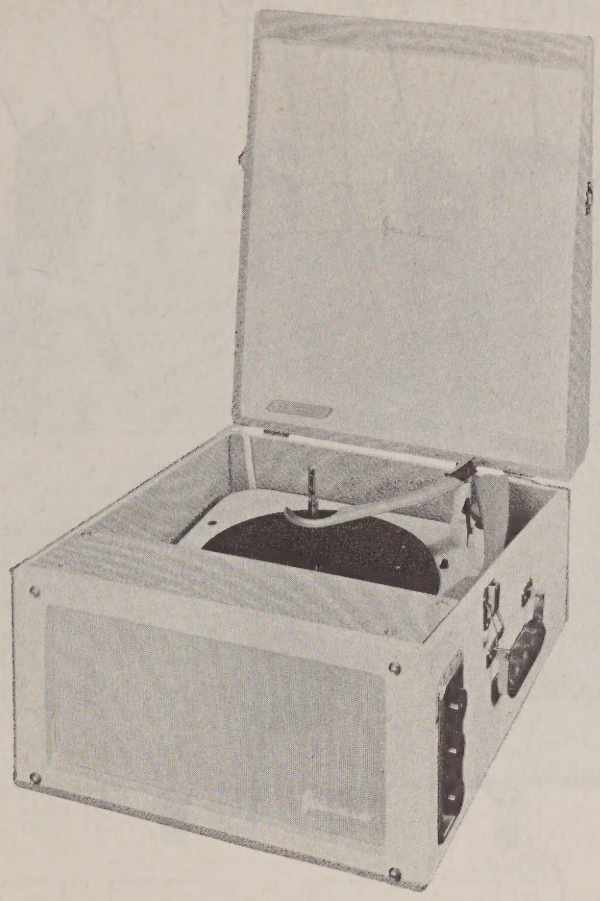
HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, Adjust the horizontal hold control until the picture synchronizes horizontally. If control must be turned fully clockwise or counter clockwise to sync picture, or if slow warm-up causes the horizontal frequency to drift, replace V20 (12AU7A).



SUB-CHASSIS H UNIT

STEELMAN
MODEL 3AR5U



PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

STEELMAN
MODEL 3AR5U

TRADE NAME	Steelman Model 3AR5U
MANUFACTURER	Steelman Phono & Radio Co., Inc., 12-30 Anderson Ave., Mt. Vernon, N.Y.
TYPE SET	AC Operated AM Superheterodyne Receiver with 3 Speed Automatic Record Changer
TUBES (Five)	Types 12BE6 Converter, 12BA6 IF Amplifier, 12AT6 Det.-AVC-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-120 Volts AC-60 Cycles
RATING	.21 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540KC-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to chassis.	455KC (400~ Mod.)	Tuning gang fully open	Across Voice Coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1620KC	"	"	A3	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1400KC	Tune to 1400KC signal	"	A4	"

FOR SERVICE INFORMATION ON RECORD CHANGER-SEE SIMILAR V-M MODEL 954B-PHOTOFACT SET #302-FOLDER #12

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1956 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under international Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America
G314

PARTS LIST AND DESCRIPTIONS

STEELMAN Model 3AR5U

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	REPLACEMENT DATA: STEELMAN PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	NOTES
V1	Converter	12BE6	12BE6	
V2	IF Amplifier	12BA6	12BA6	
V3	Det. -AVC-AF Amp.	12AT6	12AT6	
V4	Output	50C5	50C5	
V5	Rectifier	35W4	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING: CAP.	RATING: VOLT.	REPLACEMENT DATA: STEELMAN PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	150		PRS150V4030-20	BBRT43215	TCT3116	TDL-403020-150	FMT-312	TVA-3448
B	30	150							
C	20	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: STEELMAN PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C3	270			SI270	D6-271	TP41	GP2K-271	UC-5327	5GA-T27	
C4	.05	200		BPD-05	DF-503	CUB2S5		PT415	2TM-S5	
C5A	220		♦	♦PA-113-2	♦PC-151	♦116TM2	♦1408-02		♦DT-2	
B	5000									
C	5000									
D	250									
E										
C6	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C7	.01	600		BPD-01	D6-103	CUB6S1	GP3-333-103	PT611	6TM-S1	
C8	.1	400		P488N-1	DF-104	CUB4P1		PT401	4TM-P1	

♦ Items C5A, C5B, C5C, C5E, R6A, R6B, and R6C are combined in one unit. When replacing items separately, C5D and C5E should total 250MMF.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: STEELMAN PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½		AB-70	A47-1Meg-Z	Q13-137	U-53	Volume
B	Shaft			AK-4	KSS-3	Not Req.	Not Req.	Attach to R1A.
C	Switch			KB-1	SWE-12	76-1	US-26	Attach to R1A.

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: STEELMAN PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	22KΩ	½		BTS-22K	
R3	2.2Meg	½		BTS-2.2Meg	
R4	4300Ω 5%	½		BTS-4300 5%	
R5	68KΩ	1/3		BTS-68K	
R6A	6.8Meg			BTS-6.8Meg	
B	470KΩ		♦	BTS-470K	
C	470KΩ			BTS-470K	

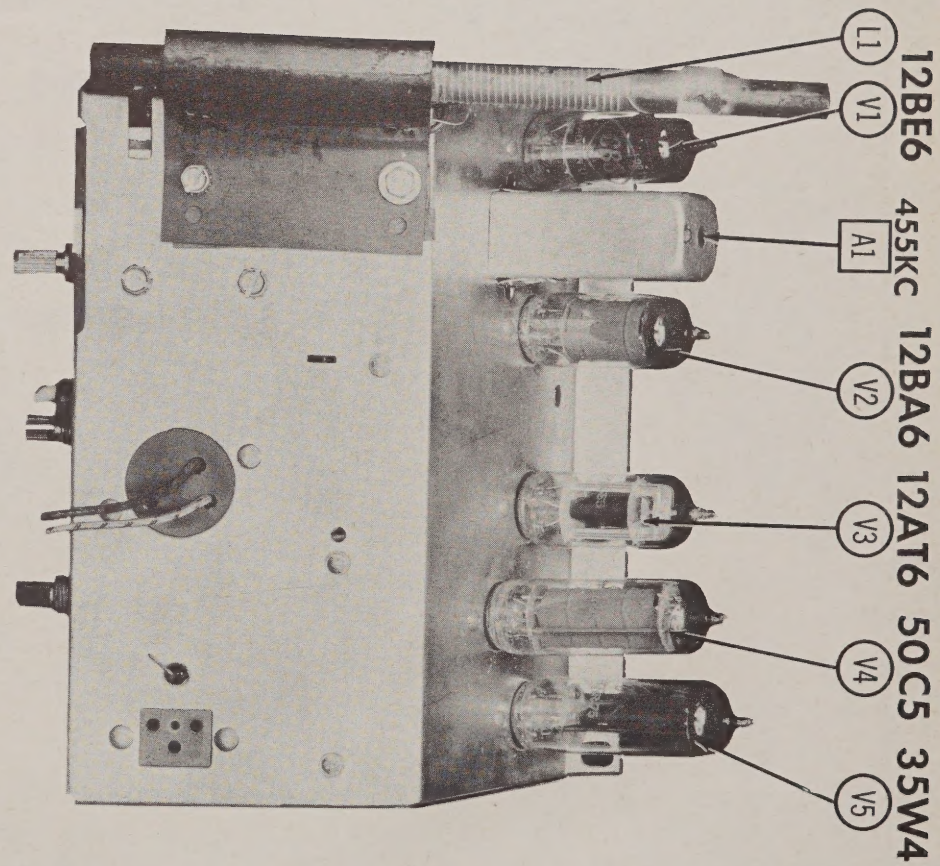
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: STEELMAN PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R7	180Ω	½		BTS-180	
R8	2200Ω	1		BTA-2200	
R9	330Ω	1		BTA-330	
R10	22Ω	1		BTA-22	

♦ Items R6A, R6B, R6C, C5A, C5B, C5C, C5D, C5E are combined in one unit.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: STEELMAN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.6KΩ	3-4Ω	TR-120	Z1101	A-3025	A-3332	22S45 ①	S-12X	① Drill one new mtg. hole.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA			NOTES
	SIZE	FIELD	V. C. IMP.	STEELMAN PART No.	QUAM PART No.	RCA TYPE No.	
SP1	5"	PM	3-4Ω	SP-105-9	5A07	205S2	

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	STEELMAN PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Ant. Coil	.5Ω						
L2	Osc. Coil	.5Ω	5.2Ω		14-1073 *		69-Osc. ■	
L3	IF Trans.	20Ω	20Ω	LF-24	16-6758	BC-352	12-C1	

* Leads sufficient mounting support.
■ Drill new mounting hole.

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	STEELMAN PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1				46T	0-1 or S-1 and 0-3	

ELECTRO VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

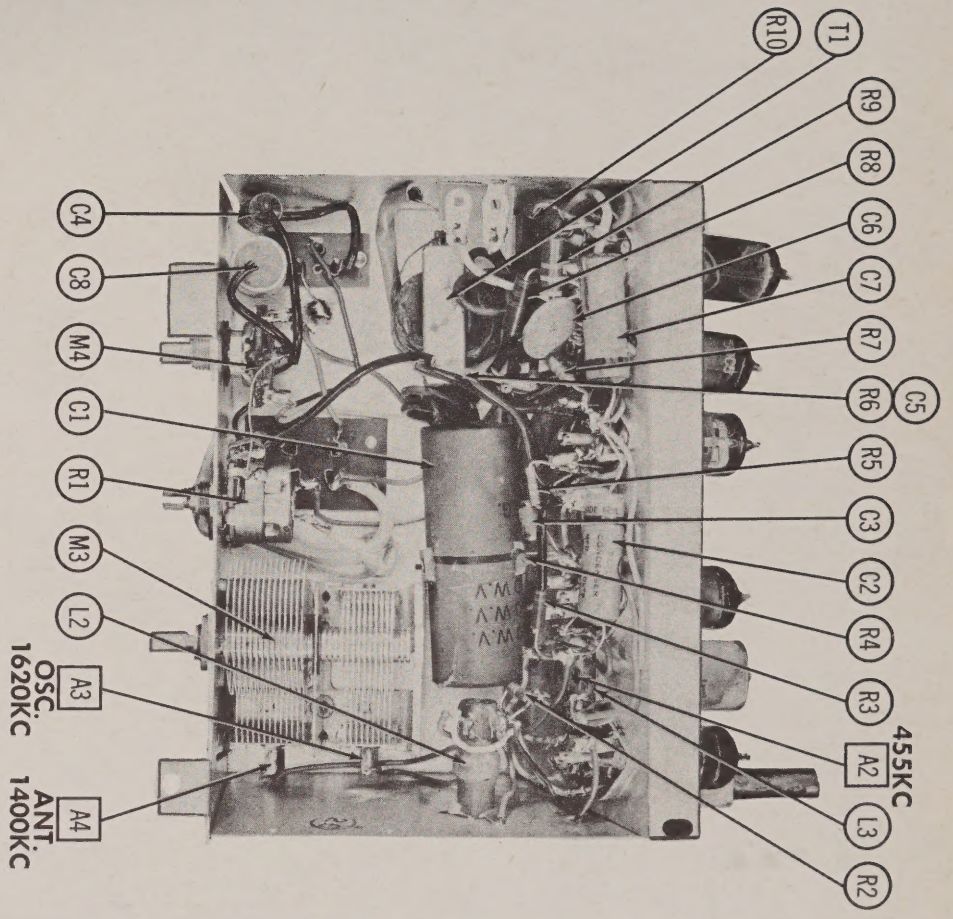
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	STEELMAN PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	
M2		† CR-55 or ♦ CR-55D and † CR-55LP or ♦ CR-55LPD	† C-449 or ♦ C-449D and † A-448 or ♦ A-448D	† W-64S or ♦ W-64D and † W-64MGS or ♦ W-64MGD	† Jewel ♦ Diamond

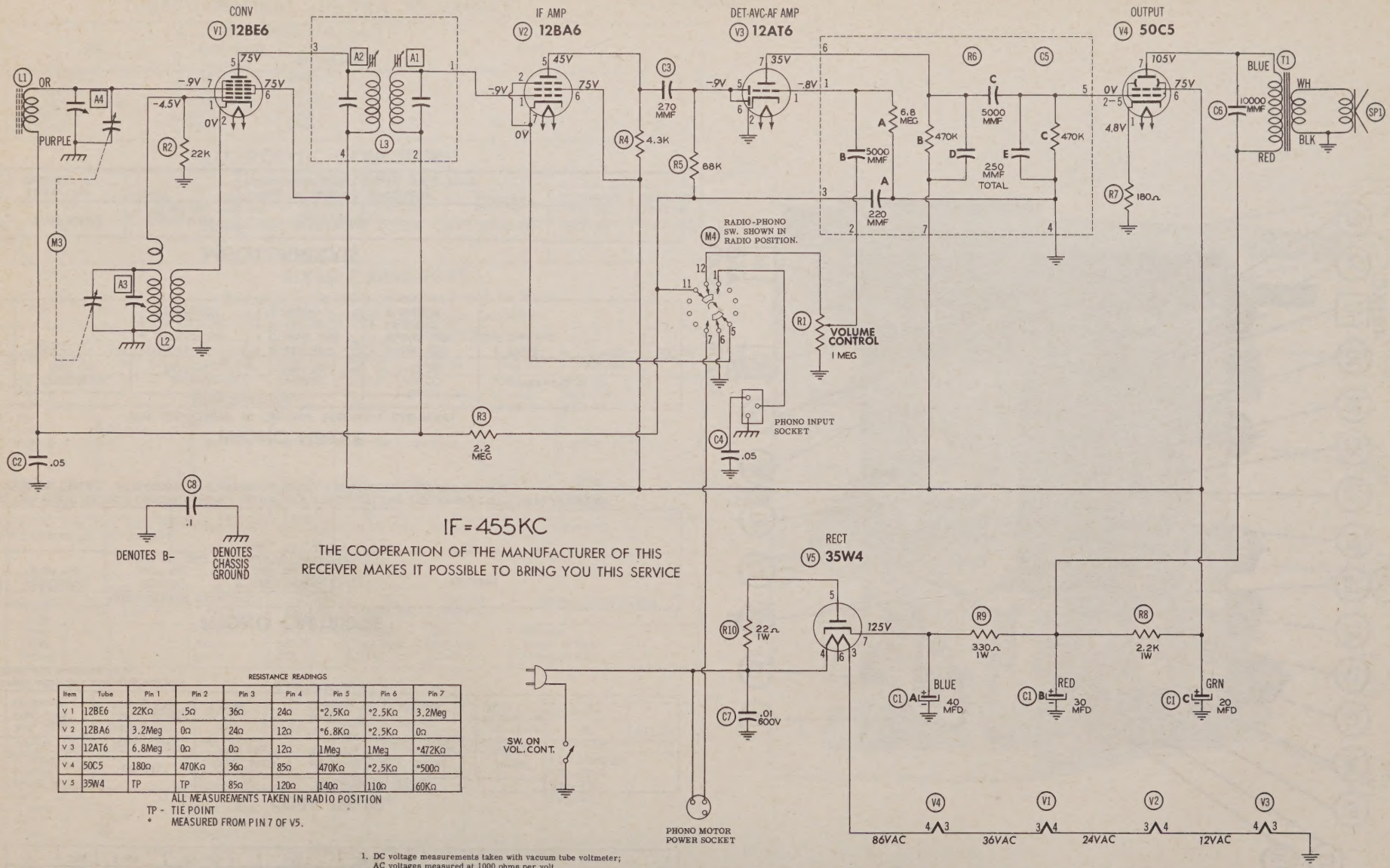
MISCELLANEOUS

ITEM No.	PART NAME	STEELMAN PART No.	NOTES
M3	Tuning Cap.	CV67	2 Gang (36-485MMF, 29-228MMF)
M4	Switch		Radio-Phono (DPDT Rotary, Wafer Type)

CHASSIS—BOTTOM VIEW



STEELMAN Model 3AR5U



IF = 455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BE6	22KΩ	.5Ω	36Ω	24Ω	*2.5KΩ	*2.5KΩ	3.2Meg
V 2	12BA6	3.2Meg	0Ω	24Ω	12Ω	*6.8KΩ	*2.5KΩ	0Ω
V 3	12AT6	6.8Meg	0Ω	0Ω	12Ω	1Meg	1Meg	*472KΩ
V 4	50C5	180Ω	470KΩ	36Ω	85Ω	470KΩ	*2.5KΩ	*500Ω
V 5	35W4	TP	TP	85Ω	120Ω	140Ω	110Ω	60KΩ

ALL MEASUREMENTS TAKEN IN RADIO POSITION
TP - TIE POINT
* MEASURED FROM PIN 7 OF V5.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

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